IT Skills

Diploma in Employability Skills
(First Semester)

Centre for Distance and Online Education
Maulana Azad National Urdu University
Hyderabad-32, Telangana- India

IT Skills
for
Diploma in Employability Skills
1ˢᵗ Semester

(SLM Based on UGC CBCS)
Editorial Board

Programme Coordinator
Dr. Gulfishaan Habeeb
Professor of English, MANUU, Hyderabad

Content Writers	Unit No.
● **Ms. Ismat Fathima**, Assistant Professor, MANUU Polytechnic, Hyderabad.	1, 8, 9, 16
● **Ms. Hajira Fathima**, Assistant Professor, MANUU Polytechnic, Hyderabad.	2
● **Dr. C V Keerthi Latha**, Assistant Professor, SCETW(A), Hyderabad.	3
● **Dr. J. Bhavana**, Assistant Professor, Dept of CS&AI, SR University, Warangal, Telangana.	4
● **Ms. Asiya Jaleel**, Assistant Professor, MANUU Polytechnic, Hyderabad.	5
● **Ms. Intesar Fatima**, Assistant Professor, Lords Institute of Engineering & Technology, Hyderabad.	6
● **Ms. Aeraj Fatima**, Asst. Professor, Lords Institute of Engineering & Technology, Hyderabad	7
● **Dr. Mohammed Yousuf Khan,** Principal, Polytechnic, Maulana Azad National Urdu University, Hyderabad.	10
● **Dr. Saba Khatoon**, Assistant Professor, Dept. of Education and Training, Maulana Azad National Urdu University, Hyderabad.	11, 13
● **Dr. Syed Arfath Ahmed**, Assistant Professor, MANUU Polytechnic, Hyderabad.	12
● **Dr. Jarrar Ahamad**, Assistant Professor, Dept. of Education and Training, Maulana Azad National Urdu University, Hyderabad.	14, 15

Proofreaders:
First　 : Mr. Imtiaz Hussain Ahmed
Second : Ms. Qanita Arsheen
Final　 : Dr. Shah Alam & Dr. S M Fasiullah

Contents

Message   *Vice Chancellor*
Message   *Director*
Introduction to the Course   *Coordinator*

Message

Maulana Azad National Urdu University (MANUU) was established in 1998 by an Act of the Parliament. It is a central university with NAAC accreditation and the mandate of the university is: (1) promotion of Urdu language, (2) accessibility and availability of professional and technical education in Urdu medium, (3) providing education through traditional and distance learning mode, and (4) a specific focus on women's education. These are the points that distinguish this central university from all other central universities and give it a unique feature. It has been emphasized even in the National Education Policy 2020 to achieve education in mother tongues and regional languages.

The very objective of promotion of knowledge through Urdu is meant to facilitate the accessibility of contemporary knowledge and disciplines to Urdu knowing community. For a long time, there has been a dearth of course material in Urdu. The non-availability of books in Urdu is a matter of concern and Urdu University considers it a privilege to be part of the national process of providing course material in mother tongue/home language as per the vision of NEP 2020. Further, the Urdu speaking community is at a disadvantage in gaining updated knowledge and information in emerging areas or newer knowledge in existing fields due to non-availability of reading material in Urdu. The unavailability of content related to the above domains of knowledge has created an atmosphere of apathy towards attaining knowledge that could significantly affect the intellectual abilities of the Urdu knowing community. These are the challenges that Urdu University is confronted with. The scenario of Self Learning Materials (SLM) is also not very different. The unavailability of course books in Urdu at school/college level comes under discussion at the commencement of every academic year. Since the medium of instruction of Urdu University is only Urdu and it offers almost all the courses of important disciplines, the preparation of books of all these subjects in Urdu is the most important responsibility of the University. To achieve these objectives, MANUU makes available course material in the form of Self Learning Material (SLM) to the students of Distance Learning. The same is also available for sale to anyone interested in gaining knowledge through Urdu. To further provide access to learning, eSLM in Urdu is available for free download from the University website.

I am immensely pleased that due to the hard work of the concerned faculty and full cooperation of the writers, the process of publications of books has begun on a massive scale. To facilitate the students of Distance Learning, the process of preparing and publication of Self Learning Material (SLM) is of paramount importance to the University. I believe that we will be able to meet the requirements of a large Urdu knowing community through our Self Learning Material and will fulfill the mandate of this University and justify our presence in this country.

With best wishes,

Prof. Syed Ainul Hasan
Vice Chancellor
MANUU, Hyderabad

Message

In the present era, distance education is recognized as a very effective and useful mode of education all over the world and a large number of people are benefiting from this mode of education. Maulana Azad National Urdu University also introduced the distance learning mode since its establishment in view of the educational needs of the Urdu speaking population. Maulana Azad National Urdu University started in 1998 with the Directorate of Distance Education and the regular programmes commenced from 2004, and subsequently various departments have been established.

The UGC has played a vital role in efficiently regulating the education system in the country. Various programs running under Open and Distance Learning (ODL) mode at CDOE are approved by UGC-DEB. The UGC-DEB has emphasized on synchronizing the syllabi of distance and regular mode to enhance the level of distance learning students. Since Maulana Azad National Urdu University is a dual mode university catering to both distance and traditional mode of learning, to achieve its goal in line with the UGC-DEB guidelines, Choice Based Credit System (CBCS) was introduced and Self Learning Materials are being prepared afresh for UG and PG programmes containing 6 blocks with 24 units and 4 blocks with 16 units respectively.

The Directorate of Distance Education offers a total of seventeen (17) programmes comprising of UG, PG, B.Ed., Diploma, and Certificate programmes. Along with this, programmes based on technical skills are also being started. A huge network of nine Regional Centers (Bengaluru, Bhopal, Darbhanga, Delhi, Kolkata, Mumbai, Patna, Ranchi, and Srinagar) and six Sub-Regional Centers (Hyderabad, Lucknow, Jammu, Nuh, Varanasi, and Amravati) was established to facilitate the students. Apart from this, an extension center has also been established in Vijayawada. More than one hundred and sixty Learner Support Centres (LSCs) and twenty Programme Centres are run simultaneously under these Regional and Sub-Regional Centers to provide educational and administrative support to the students. The Directorate of Distance Education makes full use of ICT in its educational and administrative activities, and offers admission to all its programs through online mode only.

The soft copies of Self Learning Material (SLM) for students are made available on the website of the Directorate of Distance Education and the links of audio and video recordings are also made available on the website. In addition, facilities of E-mail and WhatsApp groups are being provided to the students through which the learners are informed about various aspects of the program such as course registration, assignments, counselling, examinations, etc. In addition to regular counseling, additional remedial online counseling is being provided from the last two years to improve the academic standards of the students.

It is expected that the Directorate of Distance Education will play a vital role to bring educationally and economically backward population into the mainstream of contemporary education. In near future, changes will be made in various programmes under the New Education Policy (NEP-2020) in view of the educational needs and it is hoped that this will help in making the Open and Distance Learning system more efficient and effective.

Prof. Mohd. Razaullah Khan
Director, Centre for Distance and Online Education
MANUU, Hyderabad

Introduction to the Course

In a constantly changing environment, having employability skills is an essential part of being able to meet the challenges of everyday life. The technology revolution has coincided with the tremendous shifts in world economies over the years, and these developments have an impact on home life, the workplace, and education. Students require new life skills, such as the capacity to deal with stress and frustration, in order to cope with the escalating pace and change of modern life. They also require IT skills, communication skills, and professional skills to be better equipped for job prospects along with their academic degree.

In the light of this, the Diploma in Employability Skills is an attempt in the direction to enable students/learners to cope with growing challenges and tests in their lives. The diploma programme is designed to give a sound knowledge of various skills so as to empower the prospective students for employment, apart from helping them prepare for competitive exams. It is spread over one year (two semesters) minimum duration. The objectives of the programme are as follows:

a. to improve one's capability to be fully self-aware by helping oneself to overcome all fears and insecurities for holistic development
b. to increase one's knowledge and responsiveness of emotional competency and emotional intelligence at place of study/work
c. to provide opportunity for realizing one's potential through practical experience
d. to develop interpersonal skills and adopt good leadership behaviour for empowerment of self and others
e. to set appropriate goals, manage stress and time effectively
f. to manage competency- mix at all levels for achieving excellence with ethics
g. to increase employability skills

At the end of the one-year Diploma programme in Employability Skills, the learner would have mastered the skills for professional life. The learners would be able to appreciate communication and IT skills, understand the role of life skills and professional skills for entry into a job and for career growth. The one-year programme will prepare the learner for employment and career growth by developing their skills, apart from leading to refinement.

The **"IT Skills"** course is designed to introduce learners to the foundational concepts and practical applications of Information Technology. This course covers essential topics like basic computer operations, internet usage, word processing, spreadsheet management, and creating engaging presentations. Through hands-on activities and real-world examples, learners will develop critical digital literacy skills that empower them to use technology effectively and responsibly in their academic and personal lives. By the end of the course, students will be equipped with the confidence to navigate the digital world and explore advanced IT concepts in the future. The course is divided into four blocks, containing 4 units each.

This SLM is supplemented by audio-video lessons. You may visit MANUU's YouTube channel, https://www.youtube.com/@IMCMANUU for the complete list of AV lessons.

With you in your journey through CDOE, MANUU!

Ms. Ismat Fathima
Course Coordinator

IT Skills

Unit-1: Introduction to Computers

Structure

1.0 Introduction
1.1 Objectives
1.2 Introduction to Computers
       1.2.1 What is a Computer?
       1.2.2 Functions of a Computer
       1.2.3 Hardware and Software Components
       1.2.4 Evolution of Computers
       1.2.5 Data Representation and Data Processing
       1.2.6 Types of Computers
       1.2.7 Impact of Computers on Society
       1.2.8 Basic Computer Skills
       1.2.9 Let Us Sum Up
1.3 Learning Outcomes
1.4 Glossary
1.5 Sample Questions
1.6 Suggested Learning Resources

1.0 Introduction

Welcome to the fascinating realm of computers! Computers have become an indispensable part of our daily lives, revolutionising everything from education to entertainment and everything in between. We find computers in almost every consumer product we use today: refrigerators, microwave ovens, air conditioners, and automobiles. From the smartphones in our pockets to the powerful machines that run global corporations, computers are everywhere, shaping the modern world.

This Unit will serve as your gateway to understanding one of the most influential technologies of our time. As we embark on this journey, you will gain insights into what computers are, how they work, and why they are crucial in today's context.

We will discuss the history of computers, discovering the remarkable progress made from the early mechanical devices to the sophisticated digital systems we use today. You will also be

introduced to different types of computers and learn about their diverse applications in various sectors.

Finally, we will consider the broader impact of computers on society. We will discuss how they have transformed healthcare, communication, entertainment, education, and work. You will also learn about the ethical considerations and societal challenges of widespread computer use.

By the end of this Unit, you will have a comprehensive understanding of the foundational aspects of computers. You will be equipped with the knowledge to use computers more effectively and will be prepared for more advanced topics in subsequent units. Let's begin our exploration into the world of computers and discover the numerous possibilities they offer!

1.1 Objectives

By the end of this Unit, you will be able to:

- Define a computer and its functions.
- Identify and describe the primary components of a computer system, including hardware and software.
- Explain the history and evolution of computers, highlighting major milestones.
- Demonstrate the basic concepts of how computers process information.
- Assess the impact of computers on society and everyday life.
- Cultivate basic computer literacy, including fundamental operations and terminology.

1.2 Introduction to Computers

1.2.1 What is a Computer?

A computer is an electronic machine that accepts data, processes data, stores data, and gives us meaningful results. The word computer comes from the Latin word computare, which means to determine or calculate (by mathematical means). So when it came to naming a counting device that would perform mathematical calculations on its own, 'Computer' came as a natural choice.

Fig. 1: A desktop computer with built-in CPU (Source: pexels.com)

Unlike many devices, a computer can be programmed to carry out a wide range of tasks, making it a powerful and versatile tool. The 'data' or set of instructions fed to the computer is called a program. So, when you give instructions to a computer to perform a certain task, you are programming it to get the desired output. The set of instructions is different for each different task a computer does, thus making it possible to perform hundreds of thousands of diverse activities, from editing a photo to sending money wirelessly to controlling a rocket. The mobile phone in your pocket, the computer on your desk, and the tablet or notebook you carry around are all computers.

Now imagine the power and speed of the computer when it is connected to a network of other computers that together perform a specific task. This network is called the internet. A computer connected to the internet is the most overlooked ubiquitous phenomenon in today's world, and we could appreciate this technology better when we get to the section on Evolution of Computers later in this Unit.

1.2.2 Functions of a Computer

The computer performs 4 basic functions that are sometimes referred to as the IPOS cycle:

1. **Input:** This is the process of giving instructions to the computer using an input device such as a keyboard or a mouse. Most modern computers (or mobile phones) are

equipped with a touch interface, which the user interacts with using hand gestures and fingertip movements (touch screens function as both input and output devices).

2. **Processing**: The CPU (we will study it in subsequent sections) processes the input data by performing calculations and making decisions based on the instructions. This is where the actual "thinking" happens and hence is often dubbed the "brain" of the computer, thus transforming data into meaningful output.

3. **Output**: The processed data, which is now called information, is used to produce output, which is then displayed, printed, or played to the user. You may view the input as raw data and the output as the result of the process. Output devices like monitors (or touch screens), printers, and speakers are most commonly used.

4. **Storage**: Not all processed data is used right away. This station is like a giant warehouse that stores data, both temporary (like Random Access memory, registers, or cache) and long-term (hard drive), for later use.

The functions mentioned above are performed not necessarily in that order. Sometimes, when the input needs to be only stored in the computer, function 3 is skipped and data is stored according to the instructions.

1.2.3 Hardware and Software Components

The components of a computer can be broadly categorised into hardware and software. Both hardware and software interact in tandem for the computer to function properly. Let us study each component in detail.

Hardware Components

Computer hardware refers to the tangible and physical parts of a computer, each playing a crucial role in the functioning of the device. These components make up a computer system and work together to perform tasks as requested by the user.

1. **Central Processing Unit (CPU)**: The CPU is the brain of the computer that processes the instructions given by the user. It is also called the central processor, main processor, or simply processor. The CPU executes the instructions of a computer code and performs all the arithmetic and logic operations. The main components of a CPU include the Arithmetic-Logic Unit (ALU), registers, and the Control Unit.

   a. The **ALU** is a digital circuit that is responsible for carrying out arithmetic and logical operations, which are essential for the execution of program instructions. Arithmetic operations include addition, subtraction, multiplication, and division, while logical

operations comprise AND, OR, NOT, and XOR. The performance of the ALU is a key determinant in the overall speed and capability of a computer.

b. A **register** is a local storage space built-in on the processor. They are fast memory locations or quickly accessible storage that temporarily hold frequently used data, instructions, or storage addresses. They are the smallest memory unit available on a computer and are not part of the main memory. Registers simply act as buffers for copying data from main memory so that the processor can access it when needed. The use of registers minimises the need to access the much slower main memory, thereby enhancing the speed of operation of the CPU. The number and size of registers vary greatly depending on the architecture of the CPU. They hold between 32 bits and 64 bits of data (more about the 'bit' in Section 1.6). Some processors house 8 registers, while others contain 16, 32, or 64 registers. A register must be compatible with the processor in terms of bits, which means that a 64-bit processor requires 64-bit registers. However, most machines are backward compatible, meaning that you can install and run a 32-bit application on a 64-bit machine, but not vice versa. There are different types of registers, some of which are listed below:

      i.   Accumulator

     ii.   Memory Address Register

   iii.   Memory Buffer Register or Memory Data Register

   iv.   Program Counter

    v.   Control and Status Registers

c. The control unit is responsible for directing the flow of data between the CPU and other devices. It tells the computer's ALU, memory, and input and output devices how to respond to program instructions, thus coordinating all operations involving the peripherals and other units. The Control Unit fetches instructions from the memory, decodes them, and generates a control signal to supervise their execution in the ALU. The control unit also handles interrupts, which are signals generated by either hardware or software components to momentarily stop the processor's operations and request immediate attention towards them (i.e., hardware or software components).

2. **Memory**

Memory is used to store data and instructions that the CPU needs to access. There are two main types of memory:

A. Random Access Memory (RAM): Random Access Memory, abbreviated as RAM, is an essential element of every computer system. It is a form of volatile memory, signifying that it retains data only momentarily while the machine is operational. RAM is utilised to retain data and programs that the CPU needs for rapid access during task execution. In contrast to long-term storage (such as a hard drive), data in RAM may be accessed and modified at rapid rates, hence enhancing system performance considerably. Upon opening a program or file, it is transferred into RAM to facilitate expedited processing. Upon shutting down or restarting the computer, all data retained in RAM is erased. The amount of RAM in a computer influences its capacity to manage many applications concurrently, with increased RAM facilitating more efficient multitasking. Contemporary computers generally possess RAM quantified in gigabytes (GB).

B. Read-Only Memory (ROM): ROM is non-volatile, meaning its contents are not lost when the computer is turned off. It is used to store permanent data, such as the computer's BIOS (Basic Input/Output System).

Characteristics of ROM:

- **Non-volatile:** Data stored in the ROM is not erased when the power is turned off.
- **Read-only:** As the name suggests, data can only be read from ROM, not written to it.
- **Permanent:** The data stored in ROM is typically fixed during the manufacturing process and cannot be easily changed.

Types of ROM:

Mask ROM: The most basic type of ROM, where the data is programmed directly into the silicon during manufacturing.

PROM (Programmable Read-Only Memory): This type of ROM can be programmed once by the user using special equipment.

EPROM (Erasable Programmable Read-Only Memory): EPROM can be erased using ultraviolet light and then reprogrammed.

EEPROM (Electrically Erasable Programmable Read-Only Memory): EEPROM can be erased and reprogrammed electrically.

3. **Storage Devices**

- **Hard disc Drive (HDD):** A mechanical storage device that uses magnetic storage to store large amounts of data. It's slower compared to newer technologies but is still widely used due to its affordability and high storage capacity.

- **Solid-State Drive (SSD):** A newer type of storage that uses flash memory, allowing for faster read/write speeds compared to HDDs. SSDs significantly improve system performance, especially in loading operating systems and applications.
- **Optical Drives** (e.g., CD/DVD drives): Though less common now, they are used for reading and writing CDs, DVDs, or Blu-ray discs.
- **USB Flash Drives:** Small, portable storage devices.

4. **Input Devices**

Input devices allow users to enter data into the computer. Common input devices include:
- **Keyboard:** Used to enter text and commands.
- **Mouse:** Used to point and click on objects on the screen.
- **Scanner:** Used to convert physical documents into digital images.
- **Microphone:** Used to record audio.
- **Webcam:** Used to capture video.

5. **Output Devices**

Output devices allow the computer to display or communicate information to the user. Common output devices include:
- **Monitor:** Used to display visual information.
- **Printer:** Used to produce physical copies of documents.
- **Speakers:** Used to produce sound

Software Components

Software is the set of instructions (code) that runs on a computer. Because of its nonphysical nature, software is considered an intangible component of the computer system. Computer hardware cannot function without software. The two main categories of software are System Software and Application Software.

1. **System software** is a set of programs that controls the internal functioning of the CPU as well as all hardware devices. It runs in the background, and hence users do not interact directly with it. Handling the basic functions of the computer, the system software facilitates other software to run properly. It is also designed to serve as a platform for application software. System software includes the following:

   a. **Operating System (OS)**: It is a collection of programs that acts as an interface between the user and the computer. This is the first program to run when a computer

is **booted** (switched on) and keeps running as long as the machine is running. The OS allocates resources to different applications while also enabling the applications to communicate with one another. Windows, macOS, and Linux are operating systems used on personal computers, while Android and iOS are examples of operating systems that run mobile phones and tablets.

b. **Device Drivers:** These are a set of special programs that control or operate a particular device connected to the computer. The primary function of device drivers is to offer abstraction by acting as a bridge between a physical device and the applications or operating systems that use it. Each peripheral device requires at least one device driver. For example, a keyboard attached to a computer requires a separate device driver than a mouse connected to the same computer. And if you want to connect a new printer different from the brand that you have been using, you will have to install drivers for this new printer to set up.

c. **Utility Software:** It is a computer code designed to perform specific, routine tasks that helps manage, maintain, and optimise the computer system. Examples include:

   i.   Antivirus software: It scans for and eliminates malicious malware.

   ii. Disc Cleanup Tools: Deletes unwanted files to free up space on the hard disc.

   iii. Backup Software: Makes copies of data to prevent loss in the event of hardware failure.

   iv. File Compression Tools: Reduce file size for simpler storage and transmission.

2. **Application software** is a set of programs designed to carry out specific tasks requested by users by interacting directly with them. These programs are built on top of system software and are tailored to user needs. Application software includes spreadsheets, word processors, audio and video editors, messaging apps, email clients, e-learning platforms, file management tools, etc. Specific examples are Microsoft Word, Microsoft Excel, Adobe Photoshop, Google Chrome, Zoom, and WinRAR among others.

Check your progress:
● A computer system consists of hardware and _____.
● The CPU is also known as the brain of the computer. (True or False)

1.2.4 Evolution of Computers

The history of computers is a fascinating journey that begins with the earliest counting devices, dating back thousands of years. Ancient civilisations used the abacus and counting rods for simple arithmetic tasks like counting items. The Antikythera Mechanism from Ancient Greece, a mechanical device used to calculate astronomical positions, is the oldest known example of the analog computer. Subsequently, calculation and measurement navigational aids, firearm instruments, and surveying tools were developed in Persia, Greece, Switzerland, and France. Then came various complex analog machines for performing diverse mathematical calculations.

In the early nineteenth century, Charles Babbage devised a forerunner to the modern computer in his Difference Engine, which could do basic computations. Babbage was a European mathematician, philosopher, and inventor who built the first mechanical computer and is hence considered the "father of the computer". He later designed the 'Analytical Engine', the first general-purpose computer, in 1833. A century on, contributions by Alan Turing (Father of Modern Computer Science) and George Stibitz, among others, in automatic computing paved the way for the world's first programmable, electronic, digital computer, the ENIAC (Electronic Numerical Integrator and Computer) in 1946. Developed in the USA with a specific goal to compute the values of artillery ranges during the second world war, it was the most powerful computer of its time. It occupied a large room and was made of resistors, capacitors, vacuum tubes, relays, and switches. The war ended before the machine could be completed, so the ENIAC was employed to perform calculations for making hydrogen bombs. Hope this helps you understand and better appreciate the most often overlooked diverse nature of operations that a computer can perform. With later research came the more sophisticated and compact computers, each technology better than the last, to the present day multipurpose computers. Now let us delve into the details of the 'generations of computers' in terms of their advancement and the technology used by them.

1. **First Generation (1940–56)**: The first generation of computers was characterised by their large, bulky structure, primarily composed of **vacuum tubes** (made of glass), which rendered them extremely fragile. These were modular machines that occupied substantial physical space, often covering entire floors of buildings. They required a lot of electrical power and generated enormous amounts of heat. They used punch cards and paper tape as input. Operating in **machine language**—a low-level programming language—these computers lacked modern monitor screens for output. Instead, output

was produced via printouts. Data processing took milliseconds. The working of these computers necessitated manual configuration, wherein operators had to physically plug in wires to execute specific programs. Additionally, the introduction of new programs required the computers to be shut down for several days to allow for cooling and reconfiguration of the wiring. Examples of the first generation of computers include ENIAC, UNIVAC, and IBM-650.

2. **Second Generation (1956–1963):** Computers developed between 1956 and 1963, known as the second generation, utilised **transistors** instead of vacuum tubes. This technological shift resulted in computers that were faster, smaller, more reliable, and more energy-efficient than their predecessors. However, they still generated a considerable amount of heat. These computers used **high-level programming languages**: COBOL (Common Business-Oriented Language) and FORTRAN (Formula Translation). They employed magnetic storage discs and magnetic core memory and also introduced the CPU and input and output units. They used punch cards and magnetic tape as input and line printers as output, although data processing times were significantly reduced to microseconds. Notable examples of second generation computers include the IBM 7090, Honeywell 400, and UNIVAC 1108.

3. **Third Generation (1964-71)**: The third generation of computers marked a significant advancement with the incorporation of **integrated circuits** (ICs) instead of individual transistors. This further reduced the size and cost of computers while increasing their speed and efficiency. They not only used less electricity but also generated less heat. Integrated circuits, which combined multiple transistors onto a single silicon chip (made of semiconductor material), enhanced the reliability and performance of these systems. Third-generation computers adopted more sophisticated high-level programming languages, such as BASIC (Beginner's All-purpose Symbolic Instruction Code) and Pascal, facilitating more complex and user-friendly programming. They also featured improved input/output capabilities, including the use of keyboards and monitors, looking more or less like the desktop computers we know today. Additionally, these computers supported multitasking and multiprocessing, significantly advancing computational capabilities. The IBM 360, the PDP-8, and the CDC 6600 are examples of third-generation computers.

4. **Fourth Generation (1971-1980s)**: The hallmark of the fourth generation of computers was the use of **microprocessors,** which incorporate thousands of integrated circuits onto a single silicon chip. This innovation led to computers that are significantly smaller, more powerful, and more affordable than previous generations. Microprocessors allow for the creation of personal computers, making computing accessible to a much wider audience. Computers began to use more advanced and user-friendly operating systems, such as MS-DOS in the initial years and versions of Windows and Mac OS as time progressed. These systems provided graphical user interfaces (GUIs), making computers easier to use. Additionally, fourth-generation computers saw the introduction of more advanced storage solutions, such as hard drives, which greatly increased data storage capacity. Networking also became more widespread, leading to the development of local area networks (LANs) and eventually the internet. This generation introduced the internet to the masses, revolutionising global connectivity. Apple II, IBM PC, and Commodore 64 are examples of fourth-generation computers.

Fig 2: An IBM Victor VPC II computer (1980s) (Image: pexels.com)

5. **Fifth Generation (1980s-Present):** The fifth generation of computers, which began in the 1980s and continues into the present, focuses on advancements in **artificial intelligence** (AI) and the development of highly sophisticated computing technologies. Essentially, all fifth-generation computers are built using microprocessor technology

used in the fourth generation. The fifth generation is characterised by the use of parallel processing and superconductors, which exponentially enhanced computing power and efficiency. Additionally, these machines incorporate quantum computation, nanotechnology, and advanced AI algorithms, aiming to mimic human reasoning and problem-solving capabilities. These computers respond to natural language input and are capable of learning and self-organisation. Fifth-generation computers are also noted for their connectivity and the ability to form vast networks, including the internet and the Internet of Things (IoT). This feature enables seamless communication and data exchange across devices and platforms. All laptops, desktops, smartphones, and tablets available today are examples of fifth-generation computers.

1.2.5 Data Representation and Data Processing

Data encompasses a collection of concrete measurements, such as events, individuals, and objects, as well as abstract concepts, all of which represent quantities, qualities, and facts. It consists of raw, unprocessed variables that require context to be meaningful. When this data is processed, it is transformed into information. A single unit of data is referred to as a datum.

Data Representation

Now let us see how this data is represented in computers. Imagine you are having a conversation with a friend who only speaks a language of clicks and whistles. How would you tell them your favourite movie? Computers are kind of like that friend! They use a special code to understand information, and that code is all about zeros and ones. This code is called binary.

In our world, we use numbers with digits from 0 to 9. Binary only uses two digits: 0 and 1. But just like you can combine numbers to make bigger ones (think 823 or 2790), computers can combine these 0s and 1s to represent all sorts of things:

- **Numbers:**
  - The number 2 in binary is 10 (read 'One Zero').
  - The number 4 is 100 (read 'One Zero Zero').
- **Letters:** Each letter is assigned a unique code using a system like **ASCII** (American Standard Code for Information Interchange). For example, the letter A is 01000001 in binary.
- **Images:** An image is made up of tiny dots called **pixels**. Each pixel's colour is represented by a code made of multiple 0s and 1s.

By turning everything into this binary code, computers can store and understand all types of information. It's like a secret language that lets them work with your photos and messages and execute complicated programs!

Now you must be wondering why computers use only binary. Computers use electrical circuits, and these circuits can be either on (1) or off (0). Binary is a perfect match! The 1 or 0 used here is called a bit, a portmanteau of the words binary and digit. A nibble is composed of 4 bits, while a byte is made up of 8 bits. A byte is the standard unit for measuring digital information, and it can represent 256 different values (2^8). A word is a group of bytes, typically 16, 32, or 64 bits, used for data processing by the computer's central processing unit (CPU). Since more bits can create more complex codes, computers often use multiple bytes called the Hexadecimal System (Base-16) to represent different data types. The hexadecimal system uses sixteen symbols: 0-9 and A-F (where A=10, B=11, C=12, D=13, E=14, F=15). Each position in a hexadecimal number represents a power of 16. Hexadecimal simplifies the representation of binary numbers. It is easier for humans to read and write large binary numbers in hexadecimal form. For example, colour codes in web design and memory addresses in programming are often written in hexadecimal.

Data Processing

Just like we read above, data could be numbers from a science experiment, text from a chat message, or even a picture from your phone. So, how does a computer interpret this raw data?

Data processing is the series of operations that a computer performs to convert raw data into useful information. This process is essential for translating data into a form that is **meaningful** and **usable** for various applications. This can include calculations, comparisons, sorting, and filtering. The CPU plays a crucial role in this stage, executing instructions and performing operations on the data through a series of stages: input, processing, output, and storage (explained in Section 1.3). Processing is what takes all the raw information and turns it into something truly useful.

1.2.6 Types of Computers

Computers come in all shapes and sizes, each with its own strengths and specialties. The choice of the right computer depends on the task at hand. Let us explore the different types of computers by size and power:

1. **Supercomputers:** These are powerful and accurate machines used to tackle massive scientific and engineering problems like simulating climate change or designing new drugs. Supercomputers are the pinnacle of computational power, surpassing the

capabilities of typical computers in both processing and storage. The processing speeds of these machines are often measured in petaflops (quadrillions of calculations per second). Examples of notable supercomputers include IBM's Summit, Google Sycamore, and Fujitsu's Fugaku.

2. **Mainframe Computers:** Mainframe computers are high-performance systems primarily utilised by large organisations for applications requiring substantial data processing and reliability. Mainframes can support hundreds or even thousands of simultaneous users, making them essential for tasks that demand high availability and security. These computers are integral to sectors such as finance, government, and large enterprises, where they manage vast databases, handle extensive transaction processing, and ensure the seamless operation of enterprise resource planning systems. Prominent examples of mainframe computers include IBM's Z series and Unisys ClearPath.

3. **Minicomputers:** These are smaller than mainframes but more powerful than personal computers, often used for supporting multiple users simultaneously. Historically, minicomputers were popular in the 1960s and 1970s, used in scientific research, manufacturing, and business operations for tasks such as process control, database management, and scientific calculations. Examples include the PDP-11 by Digital Equipment Corporation and IBM's AS/400. Modern advancements have largely absorbed their functions into other types of computers.

4. **Microcomputers:** These are the personal computers (PCs) we use every day at home or work. They are compact and versatile, ideal for web browsing, writing documents, and running everyday programs. PCs are designed for individual use and offer a versatile mix of power and affordability. Personal computers come in various shapes and sizes to suit different needs. Desktops offer more processing power for demanding tasks but are less portable. Laptops provide mobility but may sacrifice some power. For even greater portability, there are tablets and smartphones, ideal for basic tasks and web browsing.

1.2.7 Impact of Computers on Society

Computers have profoundly transformed society, influencing almost every aspect of modern life. But like any powerful tool, computers come with a double-edged sword. Let us

explore these impacts, considering both the benefits and the challenges posed by computer technology.

Positive Impacts:

1. **Communication:** The internet, powered by computers, has shrunk the world. Communication is now faster, easier, and more accessible. Email, instant messaging, social media, and video conferencing platforms like Zoom and Skype have bridged geographical distances, enabling real-time communication and collaboration worldwide.

   Examples:

   - Social media platforms (e.g., Facebook, Twitter) connect people globally, allowing instant sharing of information and ideas.
   - Video conferencing tools facilitate remote work and learning, making it possible to hold meetings and classes online.

2. **Education:** Online platforms offer flexible learning opportunities, while interactive tools and simulations enhance understanding. Online courses, educational software, and digital libraries have made education more accessible, personalised, and engaging.

   Examples:

   - Online learning platforms (e.g., SWAYAM, Coursera, Khan Academy) offer courses from top universities to learners worldwide.
   - Interactive educational software and tools (e.g., Google Classroom, Microsoft Teams) enhance the learning experience for students and teachers.

3. **Work:** Computers automate tasks, analyse data, and streamline processes, boosting efficiency and productivity in almost every field. E-commerce has significantly impacted how businesses operate and compete in the global market.

   Examples:

   - Business software (e.g., CRM, ERP) improves efficiency in managing operations, customer relationships, and resources.
   - E-commerce platforms (e.g., Amazon, Flipkart) have transformed retail, allowing consumers to shop online.

4. **Healthcare**

   Computers have advanced healthcare by improving patient care, research, and management.

Electronic health records, medical imaging, and telemedicine have made healthcare more efficient, accurate, and accessible.

Examples:

- Electronic health records systems store patient information digitally, improving the accuracy and accessibility of medical records.
- Telemedicine platforms enable remote consultations and monitoring, expanding access to healthcare services.

5. **Entertainment:** From streaming services to online gaming, computers provide a vast range of entertainment options, fostering social connection and shared interests.

Examples:

- Streaming services like Netflix, Prime, and Disney+ provide on-demand access to movies, TV shows, and original content.
- Video games offer immersive and interactive experiences, connecting players from around the world in online multiplayer games.

Negative Impacts

1. **Privacy and Security**: The widespread use of computers has raised concerns about privacy and security. Cybersecurity threats, data breaches, and the misuse of personal information have become significant issues.

Examples:

- Data breaches can expose sensitive information, leading to identity theft and financial loss.
- Surveillance and data collection by companies and governments can infringe on individual privacy rights.

2. **Digital Divide**: While computers have brought many benefits, they have also highlighted and exacerbated inequalities. Access to computer technology and the internet is uneven, leading to a digital divide between those who have access and those who do not.

Examples:

- Rural and low-income communities often have limited access to high-speed internet and computer technology, affecting education and employment opportunities.

- The digital divide can create disparities in access to information, services, and opportunities.

3. **Health Issues:** Prolonged use of computers can lead to physical health issues. Problems such as eyestrain and the impact of sedentary lifestyles are associated with extensive computer use.

   Examples:

- Eyestrain and vision problems from prolonged screen time.
- Repetitive strain injuries, such as carpal tunnel syndrome, from prolonged typing and mouse use.

4. **Addiction and Social Isolation:** Excessive screen time and social media use can lead to addiction and feelings of isolation, impacting mental health and well-being.

1.2.8 Basic Computer Literacy

Now that we have learnt the overview of computers, we will dive deeper into the practical aspects of using a computer. Let us look at basic computer operations:

1. **Turning the Computer On and Off:**
   - **Turning On:** Locate the power button on the computer case or laptop and press it. Wait for the operating system to load. (Some newer All-in-one computers don't have a separate CPU case but have it in-built behind the monitor.)
   - **Shutting Down:** Go to the Start menu (usually found at the bottom-left corner of the screen), select 'Shut Down' or 'Power,' and then 'Shut Down.' Avoid turning off the computer directly from the power button to prevent data loss. (Newer versions of Windows have the Windows icon for the Start menu.)

2. **Logging in:** Enter your username and password to access the computer

3. **Using the Mouse:**
   - **Left Click:** Select items or open files and applications.
   - **Right Click:** Opens a context menu with additional options.
   - **Scroll Wheel:** Navigate through pages and documents

4. **Using the Keyboard:**
   - **Typing:** Typing is used for entering text. Familiarise yourself with the QWERTY keyboard layout.
   - **Navigation:** Using arrow keys to move the cursor

- **Special Keys:** All keyboards have special keys apart from alphanumeric keys. Understand the function of keys like Enter, Shift, Ctrl, Alt, and the function keys (F1, F2, etc.).

Now let us familiarise ourselves more about using a computer.

1. **Operating System Basics**
   a. **Desktop and Icons:** The desktop is the main screen you see after logging in. Icons represent files, applications, and folders.
   b. **Start Menu and Taskbar:**
      - The Start menu provides access to programs, settings, and power options.
      - The taskbar shows open applications and can be used to switch between them.

2. **File Management**
   a. **Creating and Managing Files and Folders**
      - **Creating a Folder:** Right-click on the desktop or in a directory, select 'New,' and then 'Folder.'
      - **Renaming Files/Folders:** Right-click on the file/folder and select 'Rename,' then type the new name.
      - **Deleting Files/Folders:** Right-click and select 'Delete' or drag to the Recycle Bin.
   b. **Using File Explorer:** Navigate through different drives and directories to locate and manage files.

3. **Basic Applications**
   a. **Text Editor (e.g., Notepad or Wordpad):** Open Notepad via the Start menu, type a simple message, and save the file.
   b. **Web Browser (e.g., Chrome, Firefox, Edge):** Open a web browser, enter a URL, and navigate to a website.
   c. **Basic Word Processing (e.g., Microsoft Word):** Open Word, type a simple document, and save it.

4. **Internet and Email**
   a. Connecting to the Internet: Ensure your computer is connected to a network via Wi-Fi or Ethernet cable.

      b. Using Email: Open your email application or webmail, compose a new message, and send it.

Basic Computer Shortcuts

Let us also learn some shortcuts that can save a lot of time and make your work more efficient. Whether you are editing documents, browsing the web, or navigating through files, shortcuts allow you to perform tasks quickly without relying on menus or mouse clicks. Here are some essential keyboard shortcuts.

1. **General Shortcuts**
   a. **Ctrl + C (copy)**: Copies the selected text or item to the clipboard.
   b. **Ctrl + X (cut)**: Cuts the selected text or item and copies it to the clipboard.
   c. **Ctrl + V (paste)**: Pastes the copied or cut item from the clipboard to the current location.
   d. **Ctrl + Z (Undo)**: Reverses the last action. Useful if you make a mistake.
   e. **Ctrl + Y (Redo)**: Redoes the last action that was undone by Ctrl + Z.

2. **File Management Shortcuts**
   a. **Ctrl + N (New)**: Creates a new document or file.
   b. **Ctrl + S (Save)**: Saves the current document or file. Make it a habit to frequently press this to avoid losing progress.
   c. **Ctrl + O (Open)**: Opens an existing document or file.

3. **Navigational Shortcuts**
   a. **Alt + Tab**: Switches between open applications. This is helpful when multitasking.
   b. **Alt + F4**: Closes the current window or application.
   c. **Windows Key + D**: Minimises all windows and takes you to the desktop.

4. **Text Formatting Shortcuts**
   a. **Ctrl + B (Bold)**: Applies bold formatting to the selected text.
   b. **Ctrl + I (Italic)**: Applies italic formatting to the selected text.
   c. **Ctrl + U (Underline)**: Underlines the selected text.

5. Web Browsing Shortcuts
   a. **Ctrl + T**: Opens a new tab in the web browser.
   b. **Ctrl + W**: Closes the current tab.
   c. **Ctrl + L**: Highlights the address bar, allowing you to quickly type a new web address.

6. **Search Shortcuts**
   a. **Ctrl + F (Find)**: Opens a search box to find text within a document or webpage.
   b. **Ctrl + H (Replace)**: Opens the find and replace dialog in many programs like Word or Excel.

7. **Power Management Shortcuts**
   a. **Alt + F4 (Shut Down Windows)**: When no application is selected, pressing Alt + F4 will open the shutdown menu, allowing you to turn off, restart, or sleep your system.
   b. **Ctrl + Alt + Delete**: Opens a menu with various options, including shutting down, restarting, or logging out.
   c. **Windows Key + X**: Opens the Power User menu, where you can select options like shutting down or restarting your system.
   d. **Windows Key + L**: Instantly locks your system, requiring a password to access it again.

8. **Force Shutdown (if necessary)**

   Power Button: Press and hold the power button for a few seconds to forcefully shut down the computer. This method should only be used in emergencies or if the system is unresponsive.

1.2.9 Let Us Sum Up

This Unit offers a comprehensive overview of computers, covering their definition, functions, components, and impact on society. A computer is an electronic device that accepts, processes, stores, and outputs data. A computer's versatility comes from its ability to be programmed to perform various tasks, making it indispensable in today's world.

We explored the four key functions of a computer: input, processing, output, and storage. Input refers to the data or instructions provided to the computer, which is then processed by the Central Processing Unit (CPU). The processed data is then presented as output, while the storage function ensures that data can be saved for later use. These core functions allow computers to execute a wide range of operations. Next, we discussed the two main components of a computer: hardware and software. Hardware includes the physical parts of a computer, such as the CPU, memory, and peripheral devices. Software, on the other hand, is a set of programs that directs the hardware to perform specific tasks. We covered two types of software: system software, which manages the computer's internal operations, and application software, which enables users to perform specific tasks, like writing a document or browsing the web.

The Unit also traced the evolution of computers across five generations, from the early, bulky machines that used vacuum tubes to the modern microprocessor-based systems of today. Each generation brought technological advancements that made computers smaller, faster, and more powerful, culminating in the AI-driven, interconnected devices we use today. We also delved into how computers represent and process data. Computers rely on binary code (a system of 0s and 1s) to represent all types of information, including text, numbers, and images. This binary data is processed through various stages to produce meaningful output. The different types of computers were also covered, ranging from supercomputers, used for complex scientific calculations, to microcomputers like personal laptops and smartphones. The type of computer used depends on the specific tasks and requirements of the user. Additionally, we examined the profound impact of computers on society. Computers have revolutionised communication, education, work, healthcare, and entertainment, providing countless benefits. However, they also pose challenges, such as privacy concerns, the digital divide, and health issues related to prolonged use. Lastly, the Unit introduced basic computer literacy, outlining practical steps for using a computer, managing files, and utilising essential applications. The Unit emphasised that mastering these skills is critical for effective use of computers in everyday life.

1.3 Learning Outcomes

Now that you have completed the Unit, you can:
- Define what a computer is and distinguish between its main components, including hardware and software.
- Recognise different types of computers and describe the unique features of desktops, laptops, tablets, and mobile devices.
- Explain the basic operation of a computer, including the input-process-output cycle and the roles of the CPU, memory, and storage.
- Describe practical applications of computers in fields such as education, healthcare, business, and everyday life.
- Demonstrate basic computer skills, including turning the computer on/off, using a keyboard and mouse, and navigating an operating system.
- Outline the historical development of computers and identify significant milestones in their evolution.

1.4 Glossary

1. **Computer**: An electronic device that processes data, performing tasks according to a set of instructions called software.

2. **Software:** A collection of programs and data that instruct the computer on how to perform specific tasks, such as word processing or gaming.

3. **Hardware:** The physical components of a computer, including the monitor, keyboard, mouse, and internal parts like the CPU and hard drive.

4. **Data**: Raw facts, figures, or information that can be processed by a computer. It can be in various forms such as text, numbers, images, or videos and is fundamental to computing operations.

5. **Operating System (OS)**: The software that manages hardware and software resources on a computer, providing a user interface and enabling the execution of applications (e.g., Windows, macOS, Linux).

6. **File**: A digital container for storing information, such as documents, images, or programs, identified by a name and extension (e.g., .docx, .jpg).

7. **Network**: A group of interconnected computers that can communicate and share resources, such as files and internet access.

8. **Internet**: A global network of interconnected computers that allows users to share information and communicate with each other through websites, email, and other online services.

9. **Interrupt**: A signal sent to the CPU by hardware or software indicating an event that needs immediate attention, temporarily halting the current process to address the event.

10. **Social Media**: Online platforms (e.g., Facebook, X, Instagram) that enable users to create and share content and interact with others in social networks.

1.5 Sample Questions

1.5.1 Objective Questions

1. What is the full form of CPU?

    a) Central Process Unit

    b) Central Processing Unit

c) Central Program Unit

d) Control Processing Unit

2. Which of the following is considered the brain of the computer?

a) Monitor

b) Keyboard

c) CPU

d) Mouse

3. The set of instructions fed into a computer to perform a specific task is called a:

a) Program

b) Algorithm

c) Process

d) Data

4. Which component is responsible for arithmetic and logic operations in the CPU?

a) Control Unit

b) Arithmetic Logic Unit (ALU)

c) Memory Unit

d) Input Unit

5. Which of the following is an example of system software?

a) Microsoft Word

b) Adobe Photoshop

c) Windows Operating System

d) Google Chrome

6. In which generation of computers were transistors used instead of vacuum tubes?

a) First Generation

b) Second Generation

c) Third Generation

d) Fourth Generation

7. What is the smallest unit of data in a computer?

a) Byte

b) Bit

c) Nibble

d) Word

8. Which of the following is not an input device?

    (a) Keyboard

    b) Mouse

    c) Printer

    d) Scanner

9. Which type of computer is the most powerful and used for large-scale scientific calculations?

    a) Microcomputer

    b) Minicomputer

    c) Mainframe

    d) Supercomputer

10. Which generation of computers introduced microprocessors?

    a) First Generation

    b) Second Generation

    c) Third Generation

    d) Fourth Generation

1.5.2 Short Answer Questions

1. What are the basic functions of a computer?
2. What are the differences between hardware and software?
3. What is data representation in computers, and why is it important?
4. What is the impact of computers on education?
5. How do you describe the fifth generation of computers?

1.5.3 Long Answer Questions

1. Discuss the major components of a computer system, including hardware and software, and explain how they interact to perform tasks.
2. What are the different types of computers, and how are they used for various applications?
3. Discuss the hardware components of a computer system.

1.6 Suggested Learning Resources

Balaguruswamy, *E. Fundamentals of Computers.* McGraw Hill India, 2009.

Norton, Peter. *Introduction to Computers.* 6th ed., Special Indian ed., Tata McGraw Hill, 2008.

Unit-2: Input, Output and Storage Devices

Structure

2.0 Introduction

Computers consist of input, output, memory or storage devices, and a Central Processing Unit (CPU). A computer system communicates with its external environment through its input/output devices. Input/output devices are connected to a computer's CPU and memory and are called peripheral devices. The input devices feed data into primary memory from the outside world, and the output devices output the information from primary memory to the user. There are

two types of memory or storage devices - primary and secondary. The purpose of this Unit is to cover the common input and output devices of a computer system and their functions, as well as the various storage devices (primary and secondary) that are used in a digital computer system.
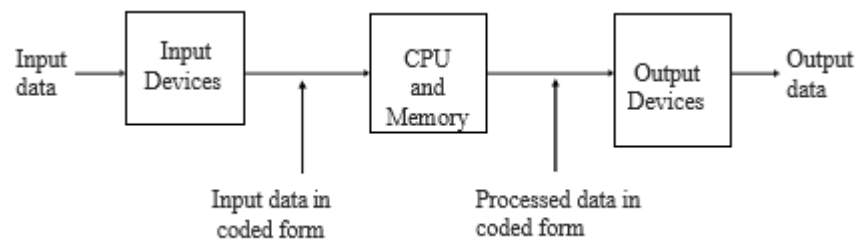

Fig. 1: Role of input/output devices in a computer system

Compared to primary storage and CPU, input/output devices are very slow. Generally, their speed depends on the movement of mechanical parts, which have limited potential for improvement. Therefore, producing input/output devices that match processor and memory speed is difficult, and there is a constant demand for quicker and faster devices.

2.1 Objectives

The objectives of this Unit are as follows:
- To identify what input and output devices are and how they are used.
- To distinguish between input and output devices.
- To explain the various types of storage devices used nowadays.
- To compare differences between primary and secondary storage devices in the digital computer system.

2.2 Input, Output and Storage Devices

2.2.1 Input Devices

These devices provide input to the computer. These devices convert user commands into binary code that the computer can understand. The most frequently used input devices are keyboard, mouse, scanner, and joystick. Some of the input devices are discussed here.

2.2.1.1 Keyboard

Keyboard is a very important input device for entering data and instructions into the computer. system. Various keys are neatly mounted on a keyboard to enter data into the computer system. As shown in Fig. 2, the 101-key QWERTY keyboard is the most popular keyboard used today.

Fig. 2: A QWERTY keyboard
(Source: pexels.com)

2.2.1.2 Mouse

The most often used input and pointing tool enabling you to choose and manipulate objects on the screen is the mouse. Its top features buttons; its bottom features a ball. One uses the left-side button more often than the right-side button. The device is positioned on a flat surface with the user's hand over it. The cursor moves because of the ball's movement on the surface. A single left click is used to select an item, while a double click on an item activates the application.

Fig. 3: Mouse
(Source: pexels.com)

2.2.1.3 Stylus

The stylus, also known as a touch pen, is a small instrument shaped like a pen that is used for input to mobile devices, tablets, and computer screens. It can be used for drawing and selecting from touchscreen devices directly on the screen. On gaming consoles such as Nintendo, Stylus is the tool of choice.

Fig. 4: Stylus

2.2.1.4 Scanner

It is a gadget used for scanning physical text, pictures, and objects using optical scanning. The scanned information is next converted into a digital picture and shown on the computer screen.

Types of Scanners

a) **Drum Scanner**: It is the most effective and costly scanner that we have. To scan, it relies on a rotating glass drum. The publishing sector extensively uses drum scanners to create high-quality images for books and periodicals.

b) **Flatbed Scanner**: It appears to be a miniature printer protected by an opaque cover on the glass window.

Fig. 6: Flatbed Scanner

The object to be scanned is placed on the glass window, which is illuminated with a bright light in the flatbed scanner. Flatbed scanners are being used at schools, homes, and small offices.

Fig. 7: Barcode Reader
(Source:openverse.org

c) **Handheld Scanner**: This is a manual machine to drag over the image's surface in order to scan it. One of the most commonly used handheld scanners in shopping malls is a barcode scanner. A combination of dark and light stripes is a barcode. It is a computer-readable representation of information that is given in the image format. The barcode reader is widely used for billing and inventory applications.

2.2.1.5 Joystick

The joystick is an input device that moves in four directions, allowing the user to control objects on a screen. In gaming centres, it's used to play games. It's got a moving stick, which stands on the base, with a couple of buttons on it.

Fig.8: Joystick
(Source: pexels.com)

2.2.1.6 Microphone

It is an input device that records and saves speech or other sounds on your computer, commonly known as a 'wav' file. Videoconferencing, radio broadcasting, speech recognition software, recording, and audio amplifying systems are very common uses of the microphone.

2.2.1.7 Light Pen

Fig. 9: Microphone
(Source: pexels.com)

It's a light-sensitive pointer, which is very useful when selecting or modifying data on the screen. The user can point at the displayed objects or draw on the screen.

Check your progress:

- A _____ is an input device used to capture physical documents and convert them into digital format.
- A joystick is primarily used as an input device for gaming and simulations. (True or False)

38

2.2.2 Output Devices

The output devices of the computer are used to display the output after processing. Some of the commonly used output devices include monitors, speakers, printers, plotters, headphones, and so on. The output can come in the form of either a softcopy (the display of the output on the monitor), a hard copy (printed on a sheet of paper), or a sound file (through some of the output devices are discussed here.

2.2.2.1 Monitor

The monitor is the most often utilised output device. A monitor is an electronic visual display for computers, commonly referred to as a Visual Display Unit (VDU). A monitor displays the output on its screen, like a television. The monitors divide a screen into thousands of pixels or millions of minute dots arranged in rows and columns, displaying the images. The pixels are so close together that they appear to be connected. The output displayed by the monitor is also called a "soft copy".

The following are the most common types of monitors:

a) Cathode Ray Tube (CRT) monitors

b) Liquid Crystal Display (LCD) or Thin Film Transistor (TFT) monitors

c) Light-emitting Emitting Diode (LED) monitors

a) **Cathode Ray Tube (CRT) Monitor:** The pixels, or phosphorus dots, that form the inner coating of the screen are illuminated by a beam of electrons in these monitors. The colour can be obtained by combining red, green, and blue (RGB) colours of different intensities. A CRT monitor is very heavy and occupies a lot of space. They are available in a variety of sizes, for example, 14 inches, 15 inches, 17 inches, and 21 inches. The 2000s have seen a decline in their use and, hence, their production due to newer technologies introduced into the market.

Fig. 10: Cathode Ray Tube (CRT) monitor (Source: openverse.org)

b) **Liquid Crystal Display (LCD) Monitor:**

LCD screens are relatively thin and light in comparison to CRT screens. They use liquid crystals (LCs) with light-modulating properties. They can be mounted on walls, which saves a lot of space. It provides a wider view angle and is available in several sizes, for example, 17 inches, 19 inches, 22 inches, and so on. They display sharp images and require less power

to run. They can be used in a variety of applications, like computer monitors, television screens, musical panels for aircraft cockpit displays, and so on.

c) Light-emitting Emitting Diode (LED) Monitor

The next evolution in the field of monitors is an LED screen. Light-emitting diodes, which act as performance-enhancing devices, are placed in these monitors. Compared to LCD monitors, LED monitors

Fig. 11: Liquid Crystal Display (LCD) Monitor (Source: openverse.org)

offer superior colour quality, clarity, and display. In terms of weight, these monitors are flat, thin, and lighter. The most obvious advantage of LED displays is that they consume a low amount of energy, which is critical for handling and charging devices like phones, watches, gaming equipment, tablets, laptops, etc.

d) Touch Screen Monitor

A touch screen is a unique type of monitor that lets users enter data by touching the icons or graphical buttons that are displayed on the screen. Additionally, it is used in businesses, movie theatres, supermarkets, museums, and other places.

2.2.2.2 Printers

Fig. 12: Touch Screen Monitor (Source: pexels.com)

The printer is a peripheral device that produces output on paper or other print medium. A hard copy is printed material on paper. There are two types of printers:

> a. Impact Printer
>
> b. Non-impact Printer

a) Impact printers:

Impact printers print through the impact of dot wires on paper, allowing direct physical contact between the printer head and the paper. They are also known as **character printers**.

The following is the classification of impact printers:

● **Daisy Wheel Printers:** They create documents of high quality. These printers generate characters per second
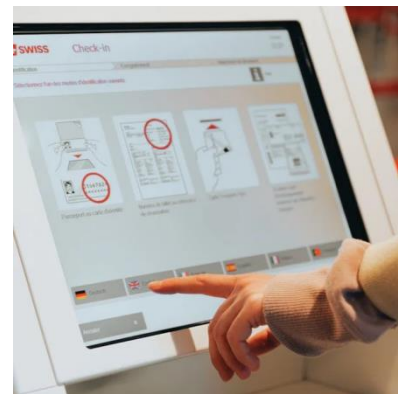

Fig. 13: Daisy Wheel Printer (Source: openverse.org)

(cps) at speeds ranging from 60 to 120. Since they were very slow and noisy, they are no longer in use.

- **Dot Matrix Printers:** They have poor printing quality and are noisy. They are hence becoming less popular. They are able to print charts and graphics in addition to text. They are comparatively affordable.

Fig. 14: Dot Matrix Printer
(Source: openverse.org)

b) **Non-impact Printers:** Non-impact printers do not allow direct physical contact between the printing head and the paper, ensuring that neither the inked ribbon nor the printed paper are struck. Only the ink used for printing has contact with the paper. Better print quality and colour graphics are also possible with non-impact printers. Thermal, inkjet, and laser printers are the three types of non-impact printers.

- **Thermal Printers**: Special heat-sensitive paper is used in thermal printers. Characters are created when heated objects make contact with the heat-sensitive paper and produce darkened dots.

- **Ink-jet Printers**: Small ink droplets are sprayed over the paper to create images. They can also make coloured images, and their output is of extremely high quality. They are affordable and perfect for the house or workplace. The cartridge is highly expensive and requires more frequent replacement.

Fig. 15: Thermal Printers
(Source: pexels.com)

- **Laser Printer**: Laser printers print using photocopier technology. A fine dot matrix pattern is created by laser printers using a laser beam and toner, which is dried powdered ink. The output on paper is of excellent quality.

Fig. 16: Ink-jet Printer
(Source: pexels.com)

2.2.2.3 Speakers

The output devices that are used to play sound are speakers. Alternating electrical current is converted into sound by a speaker. It can be placed in the system unit or connected with wires. They allow us to play music and listen to different sound effects.

Fig. 17: Speakers
(Source: pexels.com)

41

2.2.2.4 Plotters

A plotter is a vector graphic printing equipment that recognises computer commands and employs one or more automated pens to draw lines on paper. Plotters are mostly used in graphical applications such as Computer Aided Designing (CAD), which prints maps and drawings.

Plotters come in two types: flatbed plotters and drum plotters.

a) **Flatbed plotters**: A flatbed plotter is commonly referred to as a table plotter. It draws on a piece of paper that is fixed and spread out on a rectangular flatbed table. Drawings are generated on paper with a pen mounted on a moving carriage that responds to CPU signals. It is extremely slow when drawing or printing graphs.

b) **Drum Plotter**: A drum plotter is commonly referred to as a roller. It is composed of a drum on which a piece of paper is placed. The graph is then created on the paper by the drum rotating back and forth. To make a good drawing, the pen, which is attached to a fixed carriage, moves horizontally across a piece of paper. Compared to flatbed plotters, they are smaller and noisier.

2.2.3 Storage Devices / Memory

Part of the computer system, the storage unit can save the data and instructions meant for processing. It is a crucial component of the computer hardware storing data to handle the output of any computing task. Without a storage device, a computer could not run or even start. On the other hand, we could characterise a storage device as a piece of hardware meant for data file storage, transport, or extraction. It can save data permanently as well as momentarily.

Types of Computer Memory:

1. Primary memory
2. Secondary Memory

2.2.3.1 Primary memory: It is also known as primary memory or internal memory. This component of the CPU retains program instructions, input data, and intermediate results. Its dimensions are frequently reduced. The main memory has two limitations. The primary characteristic is its volatility; that is, the contents will be lost upon power cessation. The second point is that primary memory is constrained. The primary memory is categorised into two categories.:

● RAM (Random Access Memory)
● ROM (Read Only Memory)

a) **RAM:** Usually referred to as a temporary memory, it is intended to hold data meant for quick use. From a hard disc, computers load software into RAM, where it is handled and utilised by the user. Turning off the computer removes the data. RAM lets computers do a range of functions, including loading apps, web surfing, spreadsheets, game playing, etc. It helps you to rapidly move between tasks, remembering where you are in one when you move to another. It can also be used to launch and run your spreadsheet software, follow directions like all spreadsheet changes, or alternate

Fig. 18: RAM (Source: pexels.com)

between various programs like when you left the spreadsheet to check an email. Your computer consumes memory in some form virtually constantly. It changes based on the specifications, ranging from 1GB to 32GB/64GB.

There are various varieties of RAM; the most popular ones are:

SRAM: Static Random Access Memory is the full form. Comprising circuits whose recorded data lasts as long as the power source is kept on. This is also a volatile memory. From it is generated cache memory. SRAM is faster than DRAM and has a shorter access time, even if it is more costly.

DRAM: Dynamic Random Access Memory, or DRAM, is a type of memory for which binary bits are housed as electrical charges applied to capacitors. Though it is less expensive than SRAM and has higher device density, DRAM has slower access times than SRAM.

SDRAM: Synchronous Dynamic Random Access Memory is shortened as SDRAM. It proceeds faster than DRAM. It is often found in different gadgets, including PCs. Improved variants of double data rate RAM, including DDR1, DDR2, DDR3, and DDR4, which are now regularly used in office or home desktop computers and laptops, first entered the market following SDRAM development.

b) **Read Only Memory (ROM):** Since the data kept or written on these devices is non-volatile, once it is kept in the memory, it cannot be changed or destroyed. The memory from which you are only able to read but not write. This kind of memory lacks volatility. Information is permanently stored just once during production. ROM has directions for turning on a machine. The bootstrap operation is this. Other electronic appliances, such as

43

microwaves and washers, also feature it. On ROM chips, only several megabytes (MB) of data between 4 and 8 MB can be kept.

Mainly, there are three types of ROM:

- **PROM:** Programmable Read-Only Memory is shorted as PROM. One can program this kind of ROM. One employs a specialised PROM programmer to join the program on the PROM. Once a chip is programmed, the data on the PROM cannot be altered. Since PROM is non-volatile, turning off the power causes no loss of data.
- **EPROM:** Still another kind of memory is erasable programmed read-only memory. On an EPROM, one can write fresh data into the device and erase already-stored data.
- **EEPROM:** Read-only memory of electrically erasable programmable nature (EEPROM) is a kind of memory. Just applying an electric field will allow data to be deleted without UV light.
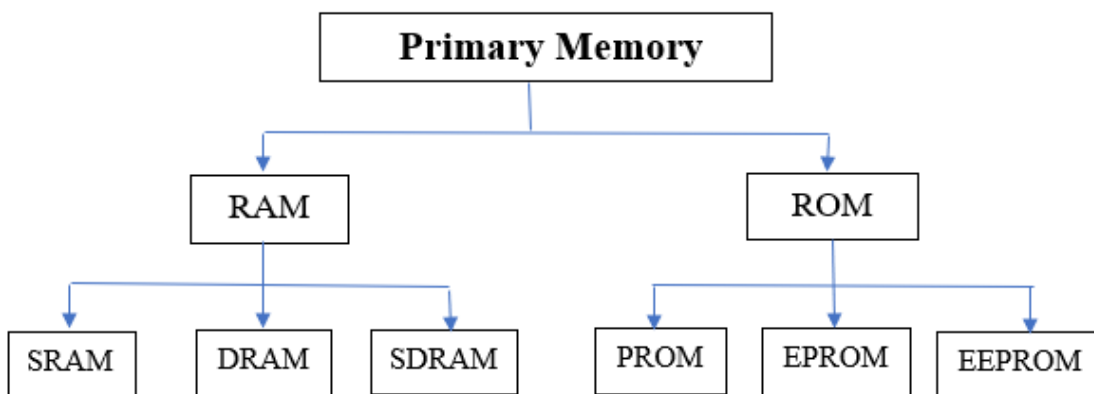
Fig. 19: Primary Memory

2.2.3.2 Secondary memory: The secondary storage is external memory of the computer. It is a non-volatile memory. The data or programs stored in secondary storage remain there even if the computer is turned off, unless they are purposefully erased. It is primarily used for storing data and programs permanently. Floppy discs, hard drives, CDs, DVDs, pen drives, flash drives, and solid-state drives are the most widely used secondary storage devices.

a) **Floppy disc:** Before the advent of CDs and pen drives, a floppy disc was frequently used on a computer to externally store data. A floppy disc consists of a plastic cartridge encased

for protection. Currently, floppy discs have been supplanted by more advanced and efficient storage methods, such as USB drives.

Fig.20: Floppy disc
(Source: pexels.com)

b) **Hard disc:** Data can be stored on a hard disc (HDD), which is a type of storage device that uses magnetic storage to store and retrieve information. A non-volatile storage device is one that allows for an indefinite number of changes or deletions to be made to their contents. Hard discs are frequently utilised in computers and laptops so that they can serve as secondary storage devices. In reality, it is simply a stack of discs, which is analogous to phonograph records. In each and every hard disc, data is recorded electromagnetically in concentric circles or tracks that are present on the hard disc. The information that is present on the track is read by a head that is similar to a phonograph arm, but it is fixed in a specific location. Although the read-write speed of a hard disc is not very quick, it is nevertheless satisfactory. There are a few gigabytes to several terabytes in the range.

c) **Magnetic Card:** It is a card that saves data by modifying or rearranging the magnetism of very small magnetic particles that are based on iron and are located on the band of the card. It is also known as a swipe card in some jurisdictions. A passcode (to gain entrance to the house or hotel room), a credit card, an identity card, and other similar things are all functions that it serves.

Fig. 21: Hard disc
(Source: pexels.com)

d) **Tape Cassette:** There is another name for it, which is a music cassette. The data on analogue magnetic tape is stored in a container that is rectangular and flat. The saving of audio recordings is a popular application for it.

e) **Super disc:** Some other names for it include the LS-240 and the LS-120. It was first introduced by Imation Corporation, and it is frequently utilised with original equipment manufacturer personal computers. 240 megabytes of data can be stored on it at any given time.

f) **CD:** Compact Disc is the name given to this type of disc. Its surface is equipped with tracks and sectors that can be used to store data. Polycarbonate plastic is used in its construction and has a round shape. It is possible for a CD to store up to 700 megabytes of data. There are two types of it:

- **CD-R:** It is an abbreviation for compact disc read-only. Once the data is written on this type of CD, it cannot be erased. It is read-only.
- **CD-RW:** It is an abbreviation for Compact Disc Read Write. It is simple to write and erase data repeatedly on this kind of CD.

Fig. 22: Compact disc
(Source: pexels.com)

g) **DVD:** The term for this type of disc is a digital versatile disc. It is possible to store data on DVDs, which are optical discs that are circular and flat. Both single-layer discs with 4.7 gigabytes of storage space and double-layer discs with 8.5 gigabytes of storage space are available. The appearance of DVDs is comparable to that of CDs; however, the storage capacity of DVDs is greater than that of CDs. It is of two types:
- **DVD-R:** It is an abbreviation for Digital Versatile disc read-only. Once the data is written on this type of DVD, it cannot be erased. It is read-only. It is commonly used to store movies and so on.
- **DVD-RW:** It is an abbreviation for Digital Versatile Disc Read Write. Date can be easily written or erased on this type of DVD several times.

h) **Blu-ray disc:** The storage capacity of a Blu-ray disc can reach up to 25 gigabytes, making it comparable to CDs and DVDs. The use of a Blu-ray disc necessitates the utilisation of a Blu-ray reader. Through the utilisation of this Blu-ray technology, a disc may be read from a blue-violet laser, which ultimately results in storage that is more densely packed and has a longer wavelength.

i) **Pen Drive:** Also known as a USB flash drive, it combines flash memory with an integrated USB interface. We can connect these devices directly to our PCs and laptops, allowing us to read and write data faster and more efficiently. These devices are incredibly portable. It is often available in capacities ranging from 1GB to 256GB.

j) **SSD:** It denotes Solid State Drive, a category of mass storage device akin to a hard disc drive. Due to the absence of optical discs, such as magnetic drives, it exhibits greater durability. In comparison to hard discs, it consumes less power, is lightweight, and exhibits read and write rates that are ten times faster. Furthermore, they are expensive. SSDs fulfil the same function as hard discs, although their internal mechanisms are markedly distinct. SSDs, in contrast to hard drives, possess no moving components and are hence designated

as solid-state drives. SSDs utilise non-volatile storage instead of magnetic discs for data retention. SSDs do not require "spin up" as they lack moving components. It is available in capacities ranging from 150 GB to many terabytes.

k) **SD Card:** It is referred to as a Secure Digital Card. It is frequently utilised for the storage of substantial quantities of data in electronic devices, like smartphones and digital cameras. It is portable, and the SD card is sufficiently compact to easily fit into electronic devices. It is available in many capacities, including 2GB, 4GB, and 8GB, among others.

l) **Memory Card:** It is widely used in digital cameras, printers, gaming consoles, and other electronic equipment. It can also store large amounts of data and comes in a range of sizes. A memory card reader is required to use a memory card with a computer.

m) **Multimedia Card:** It is also referred to as MMC. It is an integrated circuit that is commonly found in vehicle radios, digital cameras, and other electronic devices. It is an external device used to store data/information.

Fig. 26: Memory Card

2.2.4 Let Us Sum Up

This Unit explores the essential components of a computer system: input, output, and storage devices.

Input devices enable us to interact with the computer and provide it with data. Keyboards are the primary tool for entering text and numbers, while mice allow us to navigate and control the computer's cursor. Styluses, often used with tablets and smartphones, offer precise touch input. Scanners convert physical documents into digital images, and microphones capture audio input. Joysticks and light pens are specialised input devices used for gaming and graphic design, respectively.

Output devices display or reproduce information processed by the computer. Monitors are the most common output device, providing a visual interface. Printers produce hard copies of documents, while speakers generate sound output. Plotters create high-quality graphics and drawings. Storage devices are responsible for storing data and instructions. Primary memory, also known as RAM, is a high-speed memory that stores data and instructions currently being used by

the processor. Secondary memory, such as hard drives and solid-state drives, provides long-term storage for data and programs.

2.3 Learning Outcomes

Now that you have completed the Unit, you can:

- Explain the importance of input, output, and storage devices in a computer system and how they work together to process data.
- Recognise and explain the functions of various input devices such as the keyboard, mouse, stylus, scanner, barcode reader, joystick, microphone, and light pen.
- Describe how output devices like monitors, printers, speakers, and plotters are used to display or present data in various forms.
- Differentiate between primary and secondary memory and describe their roles in storing data and ensuring smooth operation of the computer.
- Understand how input, output, and storage devices work in unison to perform tasks efficiently within a computer system.

2.4 Glossary

- **Input Device:** A hardware component used to enter data and instructions into a computer system, such as a keyboard, mouse, or microphone.
- **Keyboard:** A type of input device that allows users to type text and issue commands by pressing keys.
- **Monitor:** An output device that displays text, images, and videos generated by the computer. It is often referred to as a screen or display.
- **Primary Memory:** The main storage of a computer that is directly accessible by the CPU, such as RAM (Random Access Memory), used for temporary data storage.
- **Storage Device:** Hardware used to store data permanently or temporarily, including both primary and secondary storage components.
- **RAM (Random Access Memory):** A type of volatile primary memory used to store data that the CPU is currently processing, cleared when the computer is powered off.

- **Touchscreen:** A display that serves as both an input and output device, allowing users to interact with a system by touching icons or text directly on the screen.

2.5 Sample Questions

2.5.1 Objective Questions

1. Which of the following defines a computer?
   a. A device used only for calculations
   b. A machine that performs processing tasks, stores data, and can be programmed
   c. **A device that takes input, processes it, and provides output**
   d. None of the above

2. What is the primary function of the CPU in a computer?
   a. **It processes instructions and controls other components of the computer**
   b. It stores data
   c. It displays information to the user
   d. It provides backup storage

3. Which of these is an example of computer hardware?
   a. Operating System
   b. **Monitor**
   c. Word Processing Software
   d. Browser

4. In the input-process-output cycle, which step involves displaying the result to the user?
   a. Input
   b. Process
   c. **Output**
   d. Storage

5. Which component is responsible for storing data temporarily while the computer is on?
   a. Hard Drive
   b. Power Supply
   c. **RAM (Random Access Memory)**
   d. CPU

6. What type of computer is typically used by individuals and designed for personal use?

    a. Mainframe

    b. **Personal Computer (PC)**

    c. Server

    d. Supercomputer

7. Which field benefits from computers by improving record-keeping, diagnosis, and patient care?

    a. Education

    b. Finance

    c. **Healthcare**

    d. Entertainment

8. What was one of the earliest computing machines that helped lay the foundation for modern computers?

    a. Smartwatch

    b. **ENIAC (Electronic Numerical Integrator and Computer)**

    c. Smartphone

    d. Calculator

9. Which of the following is considered software?

    a. Keyboard

    b. **Operating System**

    c. Hard disc

    d. Mouse

10. Which device is primarily used to enter data into a computer?

    a. Monitor

    b. **Keyboard**

    c. Speaker

    d. Printer

2.5.2 Short Answer Questions

1. What are the different input devices of a computer system?
2. What are examples of primary memory?
3. Write short notes on keyboard, mouse, printer, and plotter.
4. Mention the need for memory in computer systems.

2.5.3 Long Answer Questions

1. Describe the functions of memory in a computer. Explain the different types of memory.

2. Explain in detail about the various types of monitors.

2.6 Suggested Learning Resources

Goel, Anita. *Computer Fundamentals.* Pearson Education India, 2011.

Ram, B. *Computer Fundamentals.* New Age International Publishers, 2014.

Sinha, Pradeep K. *Computer Fundamentals.* BPB Publications.

Thareja, Reema. *Fundamentals of Computers.* Oxford University Press, 2018.

Unit-3: Web-based Technologies

Structure

3.0 Introduction

Web-based technology is defined as software, apps, or services that run over the internet and use web browsers as their primary interface. These technologies use the World Wide Web to provide functionality and services without requiring users to install specialised software on their local devices. These technologies facilitate access to information, communication, commerce, and entertainment from any location globally via diverse devices, such as computers, cellphones, and tablets. Web-based technologies have revolutionised our interaction with information and one another, fostering creativity and connectedness in contemporary society.

Importance of Web-Based Technologies

Web-based technologies are essential for many aspects of life and work in this modern era of digital technology. They have a prominent part in the following:

- Communication: Making it possible to communicate and collaborate in real time through the use of messaging apps, social media, and traditional email.

- The process of providing access to a massive amount of information by means of search engines, websites, and online databases is referred to as giving information access.
- E-commerce is the facilitation of online purchasing, banking, and other financial operations, which makes it possible to conduct business from any location as comfortably as possible.
- Education comprises the provision of online learning platforms and resources, with the goal of making education available to a worldwide audience.
- Providing content such as music, videos, games, and live streaming in order to enhance our leisure time is what we mean when we talk about entertainment.

3.1 Objectives

At the end of the Unit, you will be able to:
- Explain basic web concepts
- Navigate and use web browsers and search engines
- Utilize e-commerce platforms and online services
- Explore web hosting and domains
- Recognize the importance of web security and common threats

3.2 Web-based Technologies

3.2.1 Understanding the Internet

The modern internet has a rich history dating back to the 1960s. Over the years, the internet has changed tremendously from its origins as a military communication tool. The first version, ARPANET (Advanced Research Projects Agency Network), connected research computers and shared information. By the late 1980s and early 1990s, the internet went from government and academic to global commercial.

Sir Tim Berners-Lee's 1989 invention of the WWW was a turning point. The WWW made internet access easy through web pages and browsers. This innovation made the internet available to the public, causing a 1990s and 2000s internet boom. The internet connects billions of devices globally, enabling social media, e-commerce, and more.

The internet is essentially a network of networks, a global system of interconnected computer networks that use the Internet Protocol Suite (TCP/IP) to link devices worldwide. Here is a simplified breakdown of how it works:

- **Data Transmission:** Data on the internet is transmitted in little pieces known as packets. Each packet contains information about the source, destination, and data being transferred.
- **Protocols:** Protocols are standard frameworks that facilitate communication between devices. The Transmission Control Protocol/Internet Protocol (TCP/IP) is the most basic protocol for the internet, determining how data is packetised, transferred, and received.
- **Routing**: Routers are devices that transport data packets across networks. They identify the most efficient route for each packet to reach its destination. The process entails transferring data from one router to another until it reaches the intended device.
- **IP addresses**: Each device connected to the internet has a unique IP address, which acts as a postal address, ensuring that data is sent to the correct location. IPv4 (e.g., 192.168.1.1) and IPv6 (e.g., 2001:0db8:85a3:0000:0000:8a2e:0370:7334) are the two types of IP addresses currently in use.
- **Domain Names**: The Domain Name System (DNS) converts human-friendly addresses such as www.example.com into IP addresses, acting as an internet phonebook.

Different applications over the internet work on different protocols. The internet's robust infrastructure and standardised protocols are what make the vast array of web services and applications possible today. Understanding some of the key protocols is essential for grasping how the internet functions:

- **HTTP/HTTPS (HyperText Transfer Protocol/Secure):** The foundation of data communication on the web, HTTP is used to transfer web pages. HTTPS is the secure version, providing encrypted communication to ensure data privacy.
- **FTP (File Transfer Protocol):** Used to transfer files between computers on a network, FTP allows users to upload and download files.

- **SMTP (Simple Mail Transfer Protocol):** The protocol used for sending emails. It works with other protocols like IMAP (Internet Message Access Protocol) and POP3 (Post Office Protocol) to retrieve emails from servers.
- **DNS (Domain Name System):** Translates domain names into IP addresses, allowing users to access websites using human-readable addresses.

3.2.2 Web Browsers and Search Engines

Web browsers and search engines are essential instruments for accessing and exploring the extensive resources available on the internet. Comprehending their functionality and utilising them proficiently will significantly improve your internet experience.

Web Browsers: A web browser is a software tool enabling access to and viewing of web pages. It interprets the code created in languages including HTML, CSS, and JavaScript into the web pages you view. Additionally under control by browsers are your interactions with websites—that is, clicking links, filling out forms, and moving between pages. Here is a list of popular web browsers.

- **Google Chrome:** Known for its speed, simplicity, and extensive library of extensions.
- **Mozilla Firefox:** Valued for its strong privacy features and customisable interface.
- **Microsoft Edge:** Integrated with Windows and noted for its performance and security features.
- **Safari:** Apple's default browser, optimised for macOS and iOS devices.
- **Opera**: Known for its speed, built-in ad blocker, free VPN service, and unique features like the ability to integrate with messaging apps.

How Browsers Work: The process by which browsers display a web page can be broken down into the following fundamental steps.

- **Enter URL:** To enter a web address (also known as a URL), you must type it into the address bar of your browser.
- **DNS Lookup:** The browser performs a DNS lookup by contacting a DNS server in order to discover the IP address that is connected with the domain name.
- **Send HTTP Request:** The browser will send an HTTP request to the web server that is located at the IP address that was retrieved.
- **Receive Response:** The HTML content of the web page is what the server sends back to the client after receiving the response.

- **Render Page**: The browser processes the HTML, CSS, and JavaScript code to visually display the web page.

Search Engines: A search engine is a software system engineered to retrieve information from the internet. It employs algorithms to traverse, catalogue, and evaluate online sites according to their pertinence to user enquiries. Search engines assist users in swiftly locating specified information by delivering a compilation of pertinent results.

Popular Search Engines:

- **Google:** The most widely used search engine, known for its powerful algorithms and vast index.
- **Bing:** Microsoft's search engine, integrated with other Microsoft services and offering unique features like visual search.
- **Yahoo:** A longstanding search engine with a comprehensive directory and various online services.
- **DuckDuckGo:** Focuses on user privacy and does not track search history or personal information.

How Search Engines Work: Search engines execute three primary functions to deliver pertinent results:

- **Crawling**: Search engines employ bots (crawlers or spiders) to traverse the web and identify new or modified web pages by following hyperlinks.
- **Indexing:** Identified web pages are retained in a substantial database known as an index. The index comprises details regarding the content and keywords present on each page.
- **Ranking:** Upon entering a search query, the search engine employs intricate algorithms to evaluate and rank the indexed sites according to their pertinence to the query. Elements affecting ranking encompass keyword occurrence, page quality, and user engagement metrics.

Effective Search Techniques:

- Use clear and specific keywords linked to your question.
- Use quotation marks to search for a specific term (for example, "climate change impact").
- Use the minus symbol to eliminate specific words from your search (e.g., jaguar-car).
- To search within a certain website, enter site:domain.com (for example, site:wikipedia.org solar system).

- Refine your results using the search engine's advanced search tools, which include date, file type, region, and other criteria.

Check your progress:

- What is the primary protocol used for transferring web pages over the internet?

  _____

3.2.4 Websites and Web pages

While the terms 'website' and 'web page' are often used interchangeably, there is a difference between them, which is described below.

A **website** comprises a series of interconnected web pages accessible via a shared domain name. Consider a website as a book, with each web page representing a unit within that book. Websites reside on web servers and are accessible across the internet via web browsers.

A **web page** is an individual document or resource that constitutes a component of a website. Web pages are composed in HTML (HyperText Markup Language) and may encompass text, photos, videos, links, and many multimedia components. Every web page possesses a distinct URL (Uniform Resource Locator) that facilitates direct access.

Structure of a Web Page

A standard web page comprises the following essential components:

- **HTML (HyperText Markup Language):** The foundation of a web page, HTML establishes the structure and content. HTML elements are denoted by tags such as <h1> for headings and <p> for paragraphs.
- **CSS (Cascading Style Sheets)**: CSS is employed to style and arrange web pages. It governs the colours, typography, spacing, and overall visual aesthetics of the HTML elements.
- **JavaScript:** This programming language enhances online pages with interactivity and dynamic functionality. JavaScript is utilised to develop functionalities like form validation, interactive maps, and real-time updates.

3.2.5 Web Hosting and Domains

Web hosting is a service that enables individuals and organisations to render their websites available on the internet. When establishing a website, the components of your site—such as

HTML files, photos, and scripts—must be hosted on a server that maintains constant internet connectivity. Web hosting firms furnish server room for your website, along with the requisite

Types of Web Hosting

Various categories of web hosting services exist, each designed to accommodate distinct requirements and degrees of technical proficiency:

1. Shared Hosting: In shared hosting, numerous websites utilise the same server and its resources (CPU, RAM, bandwidth). This hosting option is economical and user-friendly, rendering it suitable for novices and tiny websites with minimal traffic.

- Advantages: Cost-effective, intuitive, and necessitates limited technical expertise.
- Disadvantages: Restricted resources, perhaps diminished performance, and reduced flexibility over server configurations.

2. Virtual Private Server (VPS) Hosting: VPS hosting offers a virtualised environment by partitioning a real server into several virtual servers. Each VPS functions autonomously with dedicated resources and an individual operating system, providing more control and superior performance compared to shared hosting.

- Advantages: Enhanced control, scalability, and improved performance.
- Disadvantages: Costlier than shared hosting and necessitates greater technical expertise.

3. Dedicated Hosting: Dedicated hosting provides a complete physical server only for your website. This hosting type provides optimal speed, control, and security, rendering it appropriate for high-traffic, large-scale websites.

- Advantages: Optimal performance, comprehensive control, and improved security.
- Disadvantages: Costly and necessitates significant technical proficiency for management.

4. Cloud Hosting: Cloud hosting employs a network of interconnected servers to host websites. It provides significant scalability and dependability by allocating resources across numerous servers, guaranteeing site accessibility even in the event of a server failure.

- Advantages: Significant scalability, dependability, and adaptable price contingent on utilisation.
- Disadvantages: May entail increased complexity in management and potentially higher costs for high-traffic websites.

Domain Names: A domain name is a human-readable identifier utilised to access websites on the internet (e.g., www.amazon.in). The name of your website fundamentally signifies your online presence. Domain names consist of two primary components: the second-level domain

(SLD) and the top-level domain (TLD). In "amazon.in", "amazon" constitutes the second-level domain (SLD), whereas ".in" represents the top-level domain (TLD).

The Domain Name System (DNS) transforms domain names into IP addresses, facilitating browsers in locating and accessing websites. It operates as an internet directory, correlating domain names with their respective IP addresses. Upon entering a domain name in your browser, the DNS server retrieves the corresponding IP address and delivers your request to the appropriate web server.

Registering a Domain Name: Here are the steps you need to take to register a domain name:

- Choose a Domain Name: Pick a domain name that is unusual and easy to remember that fits your website or brand. Think about using keywords that describe the material and purpose of your site.
- Check Availability: Use a domain name provider, like GoDaddy or Namecheap, to see if the domain name you want is already taken. You might have to pick a different name or look at other top-level domains (TLDs), like.net or.org, if the name you want is already taken.
- Register the Domain: Once you've found a domain name that's free, go ahead and register it with the provider of your choice. Usually, this means giving your contact information, picking a registration time (often one year), and paying the registration fee.
- Set up DNS: Once you've registered your name, you need to set up its DNS settings so that they point to the servers of your web host. This makes sure that people go to your website when they type in your domain name.

3.2.6 Ecommerce and Online Services

Electronic commerce, or e-commerce, is when people buy and sell things and services over the internet. Businesses can now reach customers all over the world without having to open real stores. This has changed the way businesses work. Consumers find e-commerce useful because it lets them shop from the comfort of their own homes at any time. Businesses can also benefit from lower staff costs and the ability to learn more about what customers like and how they act.

A lot of people and businesses use well-known e-commerce tools to make it easy to open online stores. These systems give you the tools you need to set up, run, and improve your online stores. They take care of things like listing products, keeping track of inventory, processing payments, and shipping. These are some of the most popular e-commerce sites:

- **Shopify** is a popular choice for businesses of all kinds because it is simple to use and has a large community of apps. It has secure payment handling, templates that can be changed, and marketing tools that are built in.
- **WooCommerce** is a flexible and open-source platform that lets people turn their WordPress sites into fully functional online shops. It works as a plugin for WordPress. It works with many add-ons and styles that let you change how the store looks.
- **Magento** is a platform that is strong and full of features. It is best for bigger businesses with more complicated needs. It can be customised in a lot of ways, can be expanded, and comes with a lot of useful features.

Apart from e-commerce, a number of internet services that offer efficiency, enjoyment, and convenience have become essential to modern living. Key categories of internet services include the following:

- **Cloud Storage**: Platforms such as Google Drive, Dropbox, and OneDrive provide cloud-based storage solutions, enabling users to store, synchronise, and share data across devices. These services offer secure backup solutions and promote cooperation through file sharing and editing capabilities.
- **Streaming Services:** Platforms such as Netflix, Amazon Prime Video, and Spotify offer on-demand access to an extensive collection of films, television programs, music, and various media content. These services provide tailored suggestions and enable customers to watch content across many devices
- **Social Media:** Platforms such as Facebook, X (formerly Twitter), Instagram, and LinkedIn enable communication, networking, and content dissemination. These platforms have evolved into indispensable instruments for personal engagement, marketing, and brand development.
- **Online Learning**: Educational portals such as Coursera, Udemy, and Khan Academy offer access to an extensive array of courses and educational resources. These services provide adaptable learning opportunities, allowing users to gain new skills and knowledge at their preferred pace.
- **Financial Services**: Online banking, payment gateways, and investing platforms have enhanced the accessibility and convenience of financial transactions.

Platforms such as PayPal, Venmo, and Robinhood allow users to oversee their funds, execute payments, and invest in equity via mobile devices.

3.2.7 Web Security Basics

In today's interconnected digital world, web security has become a cornerstone of maintaining online safety and privacy. The importance of web security cannot be overstated, as it protects websites and online systems from unauthorised access, data breaches, and a myriad of cyber threats. By implementing robust security measures, individuals and organisations can safeguard sensitive information, maintain the trust of users, and ensure compliance with legal and regulatory standards. A secure web environment is essential not only for protecting data but also for enabling seamless and safe digital interactions. The landscape of web security threats is vast and continuously evolving. Common threats include:

- **Malware**, which encompasses viruses, worms, trojans, ransomware, and spyware designed to harm or exploit systems.
- **Phishing attacks** deceive individuals into revealing sensitive information by impersonating trusted entities, often leading to significant financial and personal losses.
- **DDoS (Distributed Denial of Service) attacks** aim to overwhelm online services with excessive traffic, rendering them inaccessible.
- **SQL injection** is where malicious code is inserted into web forms to exploit databases. Similarly,
- **Cross-Site Scripting (XSS) attacks** involve injecting malicious scripts into web pages, potentially stealing user data or spreading malware.

Awareness of these threats is the first step toward building a secure online presence. To combat these risks, adhering to best practices in web security is vital. By understanding and implementing these principles, individuals and organisations can create a resilient defence against the ever-present risks of the digital age, fostering a secure and trustworthy online ecosystem.

- **Keep Software Up to Date:** Ensure that all software, including your content management system (CMS), plugins, and other applications, is regularly updated to patch security vulnerabilities.
- **Use Strong Passwords:** Implement strong, unique passwords for all user accounts. Encourage the use of password managers and enable multi-factor authentication (MFA) to add an extra layer of security.

- **Enable HTTPS:** Use HTTPS (HyperText Transfer Protocol Secure) to encrypt data transmitted between the user's browser and your website. Obtain an SSL/TLS certificate to enable HTTPS and ensure secure communication.

- **Regularly Back Up Data:** Perform regular backups of your website and data to ensure you can quickly recover in the event of a security incident or data loss.

- **Implement Firewalls:** Use web application firewalls (WAF) to monitor and filter incoming traffic, blocking malicious requests and protecting against common web threats.

- **Limit User Access:** Grant the least amount of access necessary to users based on their roles and responsibilities. Regularly review and update user permissions.

- **Monitor and Log Activities:** Implement monitoring and logging to track user activities and detect suspicious behavior. Regularly review logs to identify and respond to potential security incidents.

- **Educate Users:** Provide training and resources to help users recognise and avoid common security threats, such as phishing attacks and social engineering.

3.2.7 Future Trends in Web Technologies

Web technologies are perpetually advancing, propelled by discoveries and rising trends poised to transform our interactions with the internet. Remaining cognisant of these developments is crucial for individuals engaged in web development, as they present novel potential for crafting more effective, engaging, and easily available online experiences.

- **PWAs, or progressive web apps:** Progressive web apps offer a smooth user experience by fusing the finest elements of mobile and web applications. They are web apps with capabilities like offline access, push notifications, and quick loading times that have the appearance and feel of native mobile apps. It is not necessary to download PWAs from an app store in order to add them to a user's home screen. This lowers the cost of development and upkeep while also making them accessible and simple to use.

- **Machine Learning (ML) and Artificial Intelligence (AI)**: Web applications are progressively incorporating AI and ML technologies to boost functionality, increase user engagement, and offer personalised experiences. Chatbots for customer service, e-commerce recommendation engines, and AI-powered content production tools are a few examples. With their ability to automate processes and offer more profound insights into user behaviour, AI and ML will become increasingly important in web development as they evolve.

- **Voice-Activated Interfaces and Voice Search:** Voice search and voice-activated interfaces are becoming more common as smart speakers and voice assistants like Apple's Siri, Google Assistant, and Amazon Alexa gain popularity. In response to this trend, websites and online apps are implementing voice commands and optimising for voice search. The move to voice interfaces improves accessibility and gives users a more intuitive and natural way to engage with technology.

- **Augmented Reality (AR) and Virtual Reality (VR):** Augmented Reality (AR) and Virtual Reality (VR) technologies are being integrated into web programming, providing immersive and interactive experiences. Augmented Reality (AR) superimposes digital content over the physical world, whereas Virtual Reality (VR) generates wholly immersive virtual experiences. These technologies are employed in diverse applications, including e-commerce (virtual try-ons), education (interactive learning), and entertainment (virtual tours). As augmented reality and virtual reality gain prominence, web developers must investigate innovative methods to incorporate these types of experiences into their websites and applications.

3.3 Learning Outcomes

Now that you have completed the Unit, you can:
- Recount the basics of web-based technologies.
- Navigate and use the internet.
- Effectively use web browsers and search engines.
- Utilize e-commerce and online services.
- Implement web security practices.

3.4 Glossary

- **Internet:** A global network of interconnected computers that communicate using standardised protocols.
- **Web Browser:** Software used to access and display web pages on the internet.
- **HTML (HyperText Markup Language):** The standard language used to create web pages.

- **CSS (Cascading Style Sheets):** A style sheet language used for describing the presentation of web pages.

- **JavaScript:** A programming language used to create interactive effects within web browsers.

- **Domain Name:** A human-readable address used to access websites (e.g., www.example.com).

- **Web Hosting:** A service that allows individuals and organisations to make their websites accessible via the internet.

- **HTTPS (HyperText Transfer Protocol Secure):** A secure version of HTTP that encrypts data transmitted between a user's browser and a web server.

3.5 Sample Questions

3.5.1 Objective Questions

1. Which of the following protocols is used to secure data transmitted between a user's browser and a web server?
   a. HTTP
   b. FTP
   c. **HTTPS**
   d. SMTP

2. Which e-commerce platform is known for its user-friendly interface and extensive app ecosystem?
   a. Magento
   b. Shopify
   c. WooCommerce
   d. BigCommerce

3. What does the acronym PWA stand for in web development?
   a. Personal Web Application
   b. Progressive Web Application
   c. Private Web Application
   d. Public Web Application

4. Which of the following is a key characteristic of cloud hosting?

a. Fixed pricing

b. Requires significant technical knowledge

c. Limited scalability

d. High scalability and reliability

5. What is a standard framework that facilitates communication between devices?

a. Domain Name

b. IP address

c. Protocol

d. Web Browser

6. What is the function of the Domain Name System (DNS)?

a. Converts human-readable domain names into IP addresses

b. Encrypts internet traffic

c. Transfers emails between servers

d. Routes data packets across networks

7. What does an IP address represent?

a. A unique identifier for a device on the internet

b. A web page's title

c. A file format for transferring images

d. A search engine index

8. What does VPS hosting provide compared to shared hosting?

a. More control and dedicated resources

b. Free domain name registration

c. A complete physical server exclusively for one user

d. Limited scalability

9. Which of the following platforms is NOT an e-commerce service?

a. Shopify

b. WooCommerce

c. Microsoft Edge

d. Magento

10. What is the role of a web browser?

a. Hosts websites on a server

b. Retrieves and renders web pages for users

c. Transfers emails between users

d. Converts IP addresses into domain names

3.5.2 Short Answer Questions

1. Mention the importance of web-based technologies.
2. List some protocols the internet uses to function.
3. Distinguish between a website and a web page.
4. Write a short note on the types of web hosting.
5. Write the steps to register a domain name.

3.5.3 Long Answer Questions

1. Describe the common threats to web security. Mention the best practices to be followed for a secure web experience.
2. Describe the internet. Explain how it works.

3.6 Suggested Learning Resources

McGloughlin, Stephen. *Multimedia on the Web.* Macmillan Computer Publishing, 1997.
Sharma, Pankaj. *Introduction to Web Technology.* SK Kataria and Sons, 2011.

Unit-4: Software and Cyber Security

Structure

4.0 Introduction

The Internet has made changes in every walk of life. The basic services that the internet provides are email, Usenet, messaging services, and file transfer protocols. Today, the internet is used to play games, perform online transactions, send greetings, listen to music, attend online classes virtually, etc. World Wide Web (WWW) uses the well-known protocol HyperText Transfer Protocol (HTTP) to communicate to share and exchange information. Generally, web pages contain information consisting of videos, pictures, text, and audio. These web pages connect through application software to the browser. The common browsers that we come across are Chrome, Firefox, Internet Explorer, and Safari. The main purpose of this Unit on "cyber security" is to study how to protect from unauthorised criminal-minded people and also against cyber threats.

As cyberattacks are common as networks grow in size, a huge variety of cyber security resolutions are required to mitigate community cyber risks.

4.1 Objectives

On completion of the Unit, you will be able to:
- Explain the need for Cyber Security.
- Gain a basic understanding of cyber crimes.
- Identify types of Malware.
- Describe the goal of Cyber Security.
- Recognise Cyber Security techniques.

4.2 Software and Cyber Security

4.2.1 Introduction to Cyber Security

4.2.1.1 Need for Cyber Security

Security is a major essential factor that helps the entire world because it defends from various types of fraud. It safeguards electronics and personal information from different types of attacks. It reduces the risk of cyberattacks and alerts how to manage and recover. A cyberattack or cyberthreat can be defined as a way to obtain illegal access in the network whose main aim is to cause harm/danger.

Cybersecurity assists in protecting computer systems, mobiles, servers, electronic devices, networks, and data from malware attacks, so it is named "Information/Electronic Technology Security."

4.2.1.2 Cyber Crime

Cybercrime is used to define an unlawful action often committed by negative-minded people with the intention to steal and cause damage to computers, smartphones, and personal digital assistants of different networks that are used as an instrument or/and target of criminal activities.

Broadly, cybercrimes are categorised into 4 ways.

1) **Against Individuals** : such as email spoofing, cyber harassment, cyber stalking, spamming, and cyber defamation

2) **Against Property**: such as credit card frauds, computer wreckage, intellectual property, trespass, and phishing.

3) **Against Organisations**: such as unauthorised accessing of data, email bombing, data diddling, denial of service, virus attack, Trojan horse.

4) **Against Society**: such as cyberbullying, webjacking , digital and cyberterrorism, pornography, and online gambling.

Various kinds of cybercrime are:

1. **Cyberstalking** is a crime that is done on the internet to harass another person.

2. **Child pornography** exploits children by taking videos and pictures

3. **Forgery and Counterfeiting: an** intruder alters the documents with the intent to deceive.

4. **Software piracy laws:** crime related to illegal/copying/installing of the copyrighted software.

5. **Cyberterrorism** denotes unauthorised assaults, unlawful intrusions, and threats against computers and networks that are politically motivated attacks that result in violence.

6. **Phishing:** attackers send malicious emails designed to track people into falling for a scam.

7. **Computer hacking** is an unauthorised act of accessing a computer system to steal, alter, or destroy data.

8. **Cybersquatting** means the unauthorised registration and usage of Internet domain names that are the same or similar to trademarks.

9. **Denial of Service Attack (DoS):** this offence causes to turn off the system or network, making it unreachable or isolated to end users.

10. **Email spoofing** is a type of cyberattack in which a hacker sends an email that has been manipulated and seems as if it originated from a trusted source.

4.2.1.3 Types of Malware

Malware, so-called "malicious software," is designed to harm intentionally to get complete access to data, cause disruption without the consent of the user, gain unauthorised access, and unknowingly interfere in user's security and privacy issues. They leak private information and perform unwanted works on the computer with the assistance of a third party. A number of

malwares seriously cause damage to the performance and sidetrack to capture the most sensitive data from the host machine.

Some popular malwares are:

1) **Adware:** a special type of various pop-up advertisements that redirects the pages.

2) **Spyware: a** software tool that is loaded into the target system without any willingness of the user whose major intent is to catch-hold (conceal) sensitive information from the far target machine.

3) **Browser hijacking:** A malware, when it is downloaded with free software, performs changes to the browser settings and redirects links to some other unintentional websites

4) **Virus**: A code inscribed to damage the system by copying, deleting, or replicating occupies memory space. It spreads through images, emails, and audio or videos.

5) **Worm:** A standalone malware that replicates itself and infects other computers in the network.

6) **Trojan Horse:** A code that misleads users, acting as useful software, but as on when the user hits on the pop-up links in the website or sometimes downloads the file/folder, behaves and pretends as very useful but causes harm to the host computer and is controlled by the remote computer.

4.2.2 Goal of Cyber Security

The basic aim of cyber security is to safeguard information from cyberattacks. It mainly uses the standard known as the "CIA trio". The major three components of this model are confidentiality, integrity, and availability. CIA is a security measure that consists of a triangle of these three connected components.
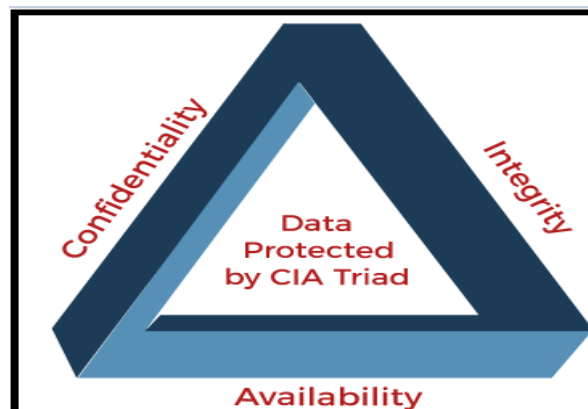
Figure 1 - CIA Triad

4.2.3 Cyber Security Techniques

Essential cyber security techniques are as follows:

1. **Authentication**: It is the process of identifying a user or device with authorised credentials when given gain access to secure systems. There are three types of authentication: personal identification number (PIN), biometrics (retina scans, finger prints, and voice recognition), and a token (such as a bank card).

2. **Encryption**: in this technique, actual information is converted into secret code that hides true meaning. It is the process of encoding data from original plain text to cypher text, which can only be decrypted using the secret key.

Figure 2: Encryption

3. **Digital signature:** This is the method of verifying the authenticity of digital messages or documents. It is not only used for identity verification but also used for authentication. Digital signatures are created using cryptographic algorithms, which are used for protecting digital documents.
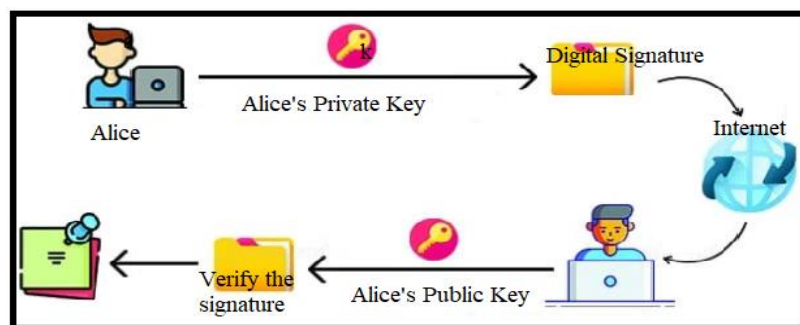
Figure 3 – Digital Signatures verification process

4. **Antivirus:** To check malicious codes to enter our system. A special program is designed to detect and remove viruses known as anti-viruses, which are used to defend the system/laptop against harmful viruses.

Figure 4 – Types of Antivirus

5. **Firewall: A** firewall provides security to the networks from different types of attacks. It monitors network traffic and controls to and fro based on defined security rules.
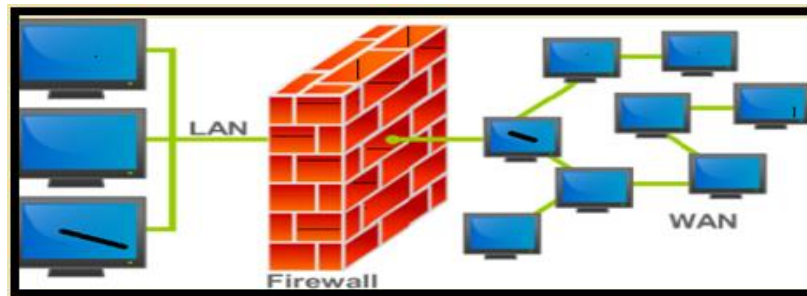

Figure 5 - Firewall

6. **Steganography:** This is a method of wrapping/hiding/secret text or information in the form of text or message that is embedded in an image that can only be retrieved by implementing certain special techniques.

Figure 6 -Steganography

Check your progress:

1. What is the term for software designed to harm or exploit computer systems?

   _____

4.2.4 Tips for Safe Browsing

● Install antivirus software.

- Clear Browsing History

- Utilize Two-factor Authentication

- Use Google Safe Browsing Service

- Update your operating system, apps and browser

- Do not access personal or financial information via public Wi-Fi

- Download apps only from reputable sources with a good reputation

- Passwords should be at least 8 characters long with a mix of upper and lowercase numbers and at least one special character

- We have to pay through securely only using "https://"

- Turn off features like location when you are not using your device

4.2.5 Usage of Windows Security on Windows10 (Hands-on)

a. **Virus Threats and Protection**

   Step1- Go to Start-> Windows Security
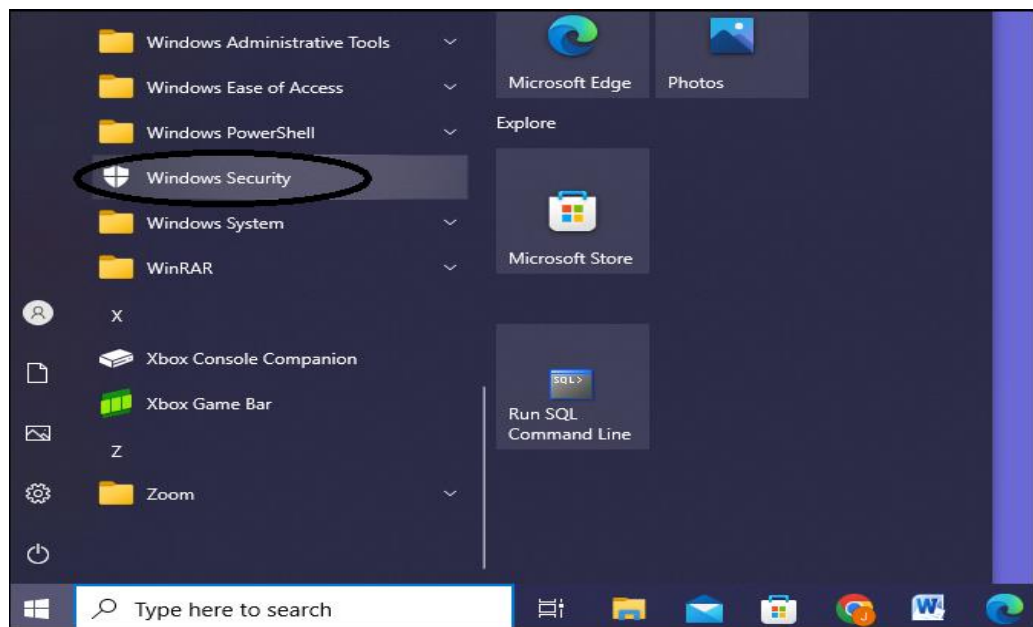
Figure -7 Windows Security

Step2- Select on Virus & threats protection
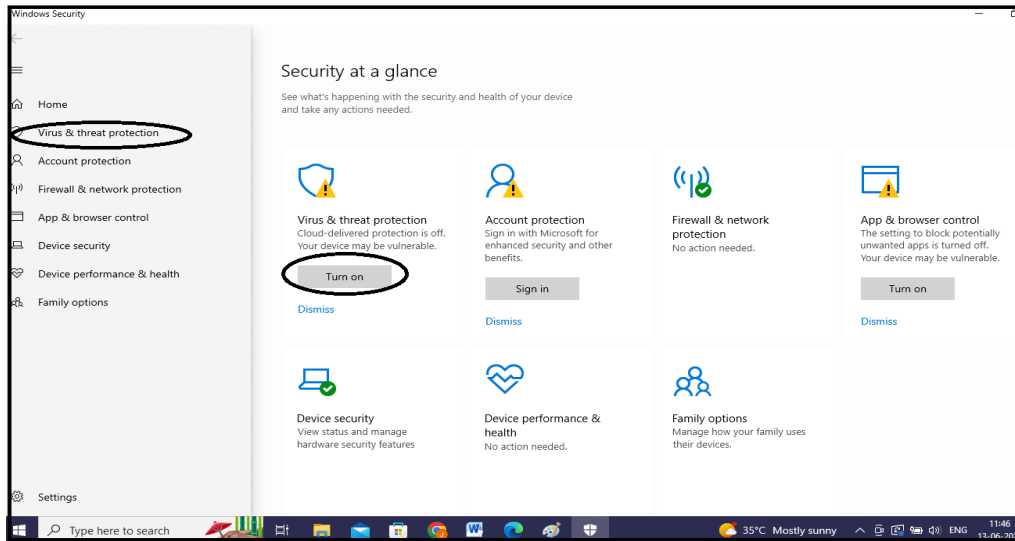
Figure 8 – Select Virus & Threat protection – Turn ON

Step3 – Select Scan Button – then select Scan option -> Scan Now
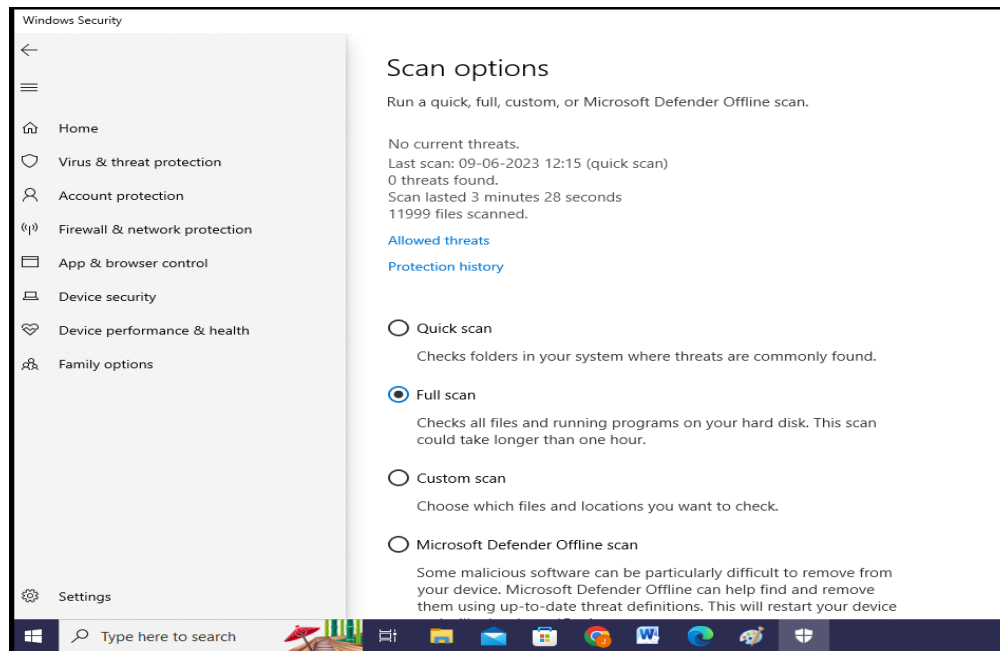
Figure 9 – Select Scan options

b.Account Protection

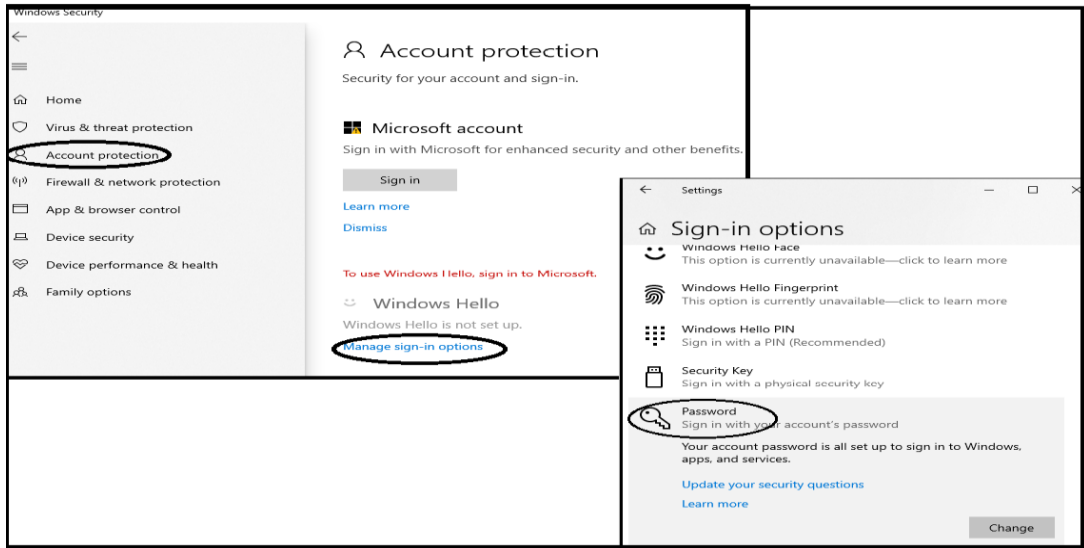Start->Windows Security->select Account protection->Windows Sign-in options ->password

Figure 10 – Account Protection

c. Firewall and Network Protection

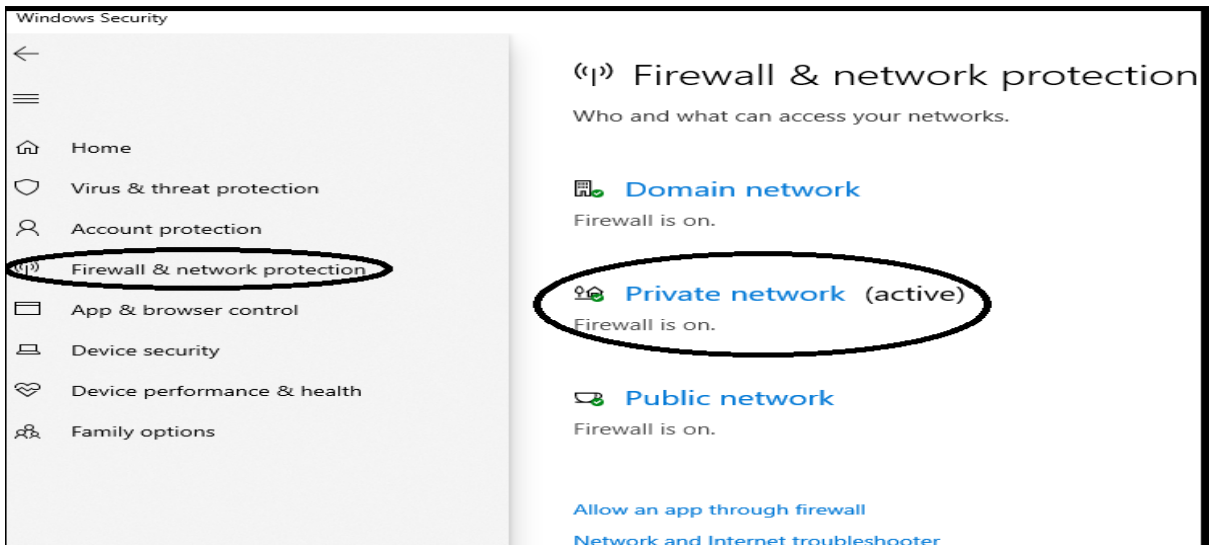Start->Windows Security ->Firewall & network protection -> Private network Firewall ON

Figure 11 – Firewall protection

d. App & browser Control

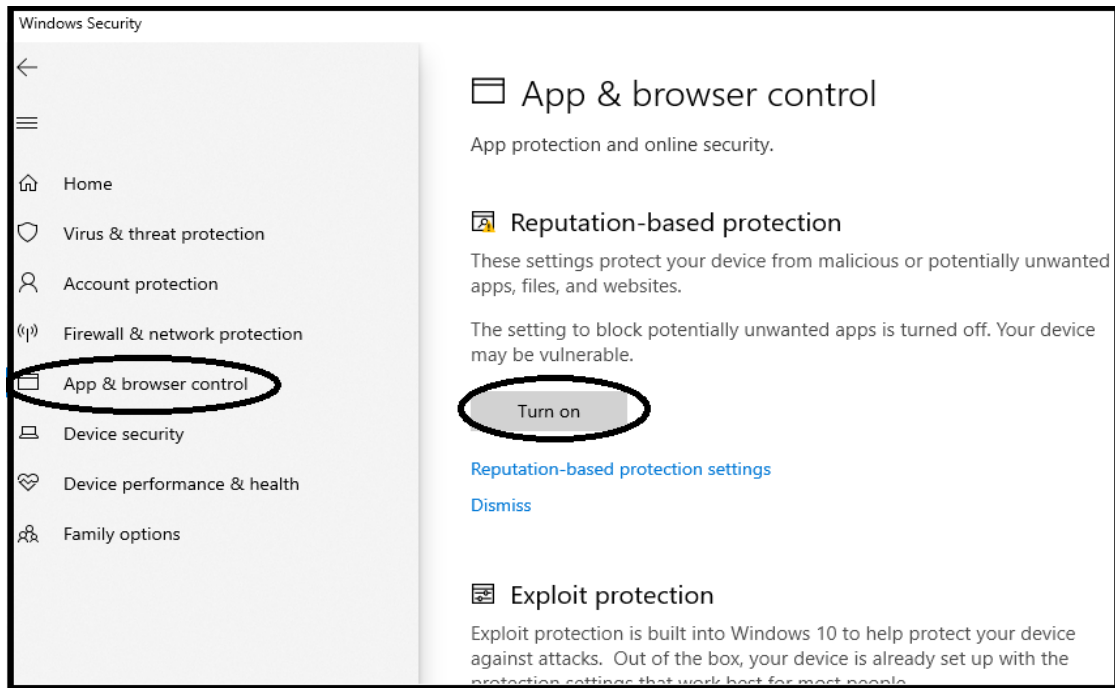Start->Windows Security->App & browser control option

Figure 12 – App & browser control

e. Device Security

Start->windows security ->select device security ->core isolation on
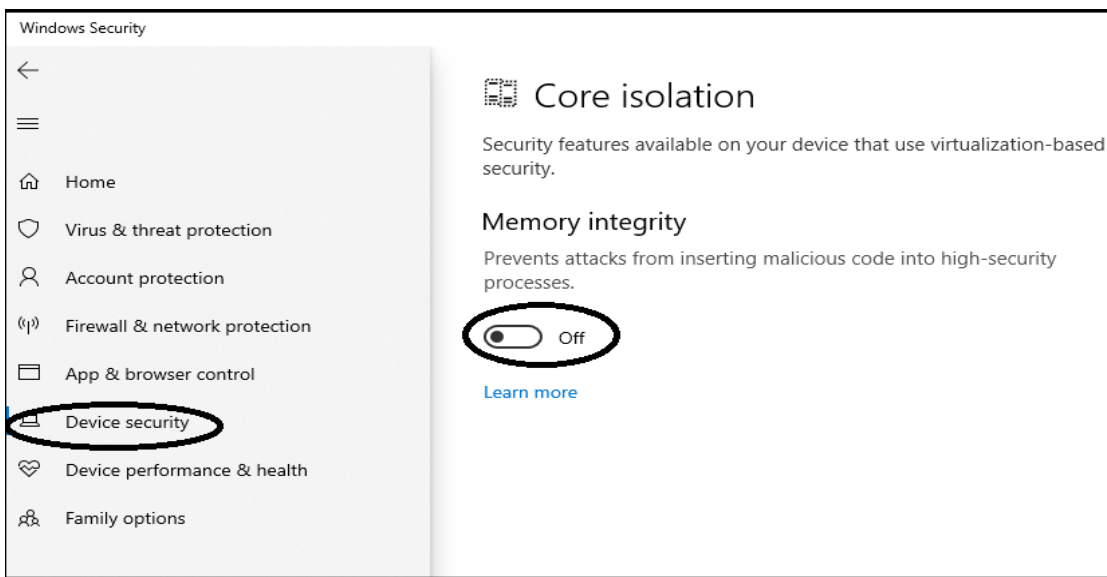

Figure 13- Device Security

f. Device performance & health

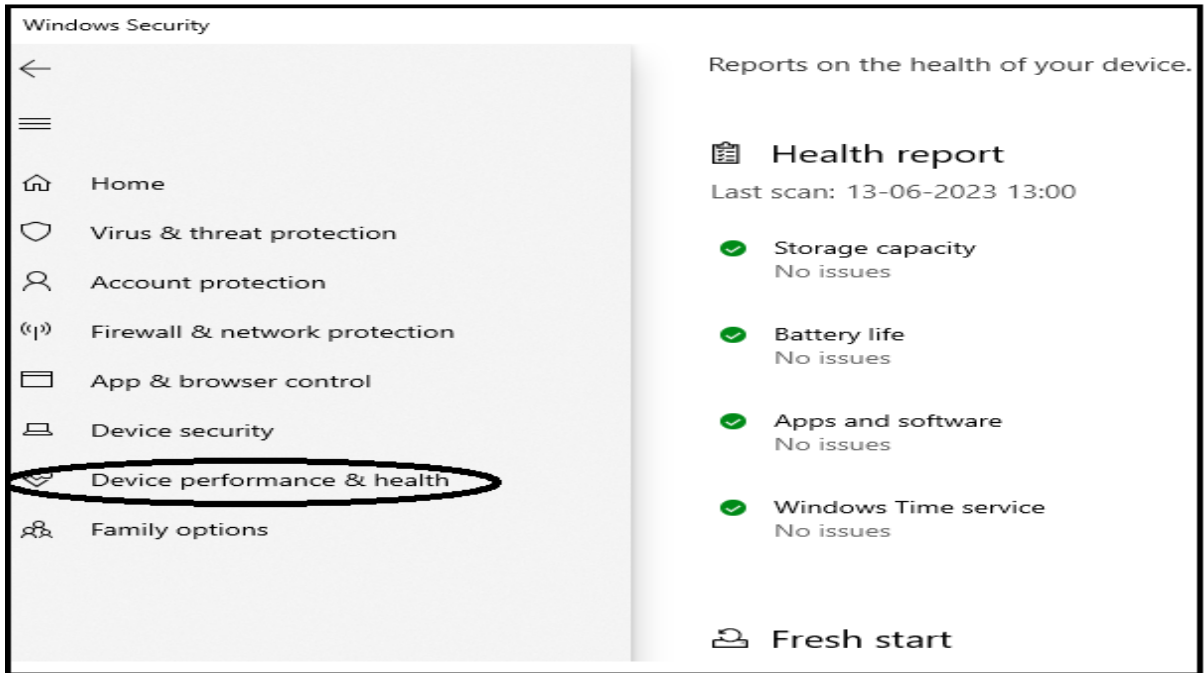Start->Windows Security-> Device performance & health ->check

Figure 14 - Device performance

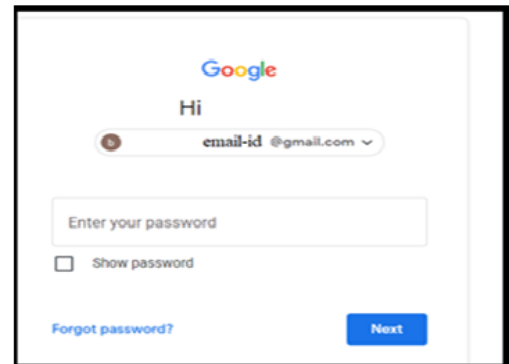## 4.2.6 Enabling Two step Verification for Gmail Account (Activity1)

Figure 15 –gmail Login and password

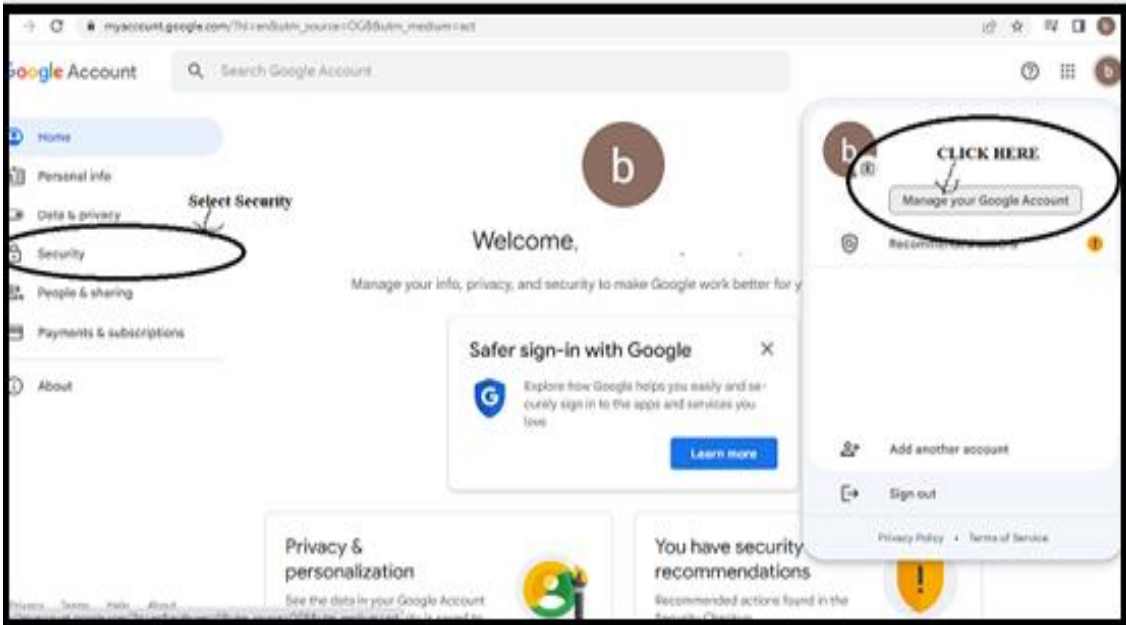**Step3- On the Right Side of the Account ->Click Manage your Google Account**

Figure 16– Manage Accounts- Security

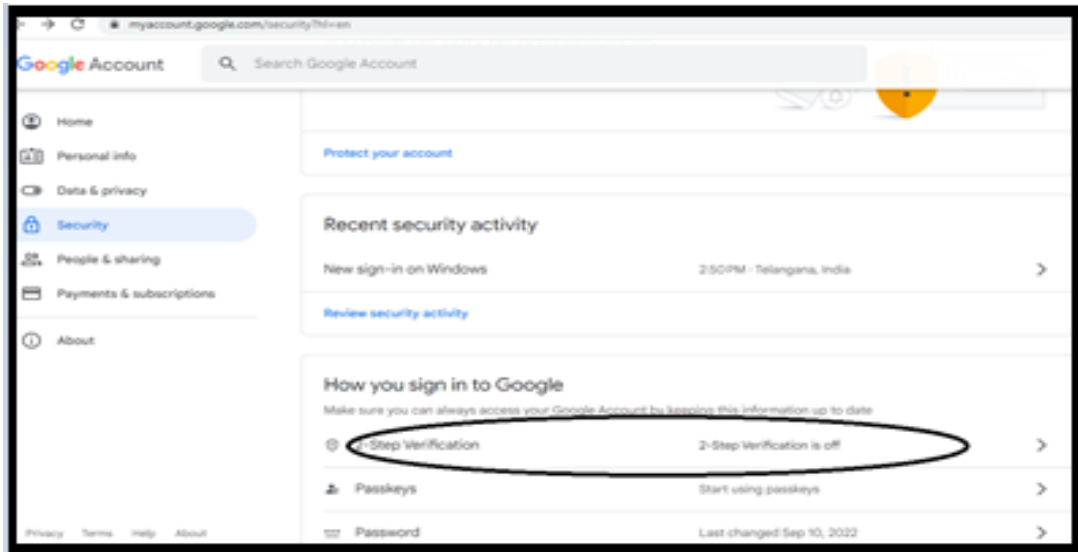**Step4**- Select Security Left Side ->Select 2-Step Verification

Figure 17– 2-step Verification

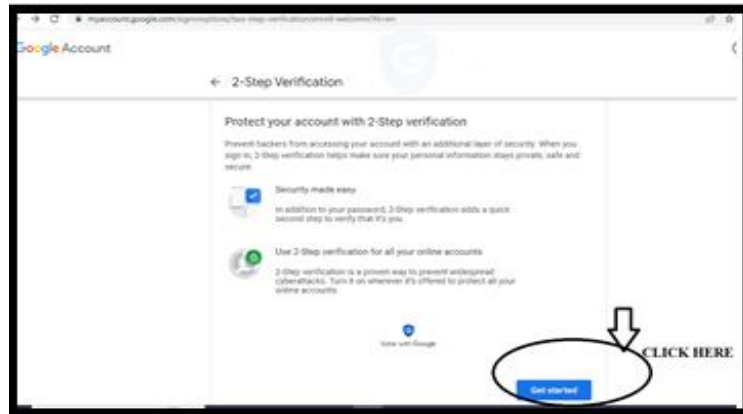**Step5**- Select 2-step Verification ->Click on get started

Figure 18 -2-step-verification- getstarted

Step6 –Enter our Password for your email

Figure 19 – Enter password

Step7 - Enter our phonenumber/text ->Click Next
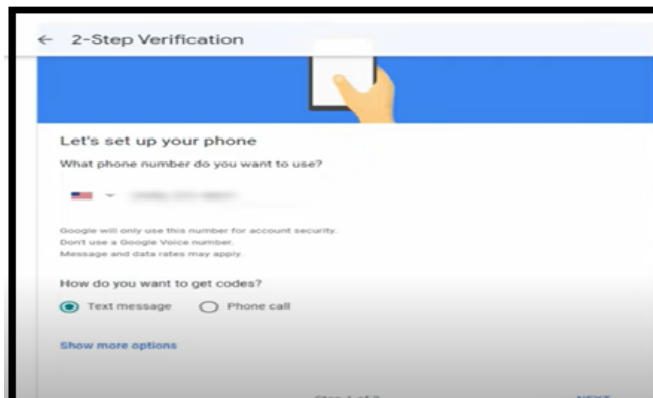
Figure 20 – Verification code

Step8 - You receive a message on your Phone ->Enter the code in the Text Field->Click Next
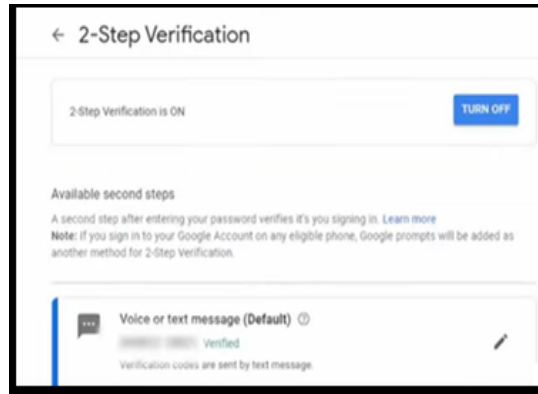
Figure 21 – Final_verification_on

Step9 - Click on Finish

4.2.7 Windows 10 - How To Password Protect Your PC (Activity 2)

Step1-Select Start > Settings > Accounts > Sign-in options

Figure 22 – Start button

Step2- Click on Add then Create Password

Figure 23 –Add Password

Step3 – To Change Password/Remove password

Figure 24 – Change password

Step4 – Change the Password

Figure 25– Set new password

4.2.8 Let Us Sum Up

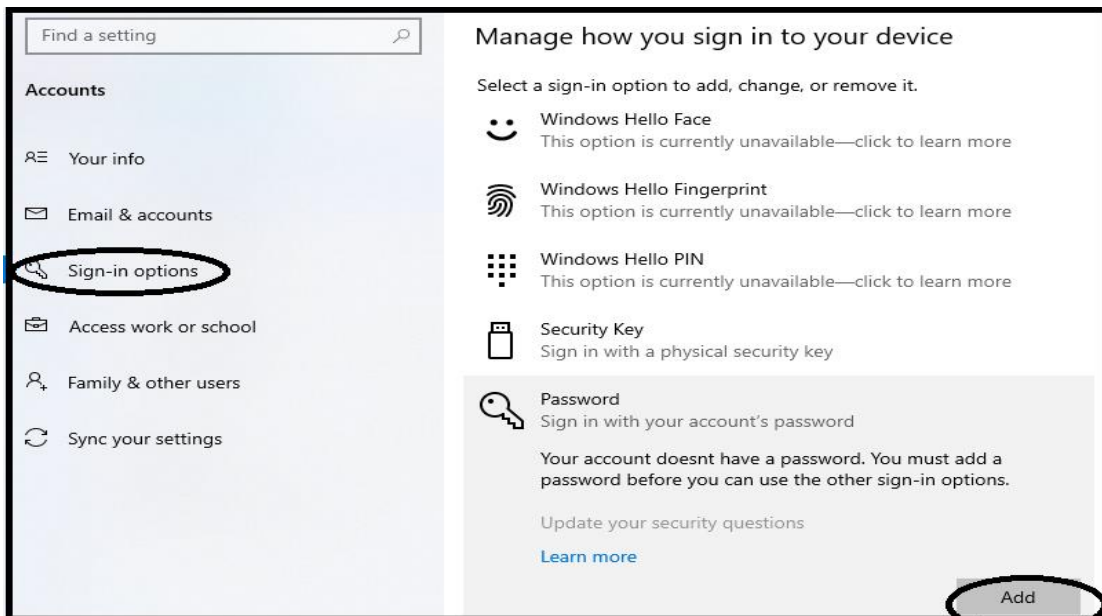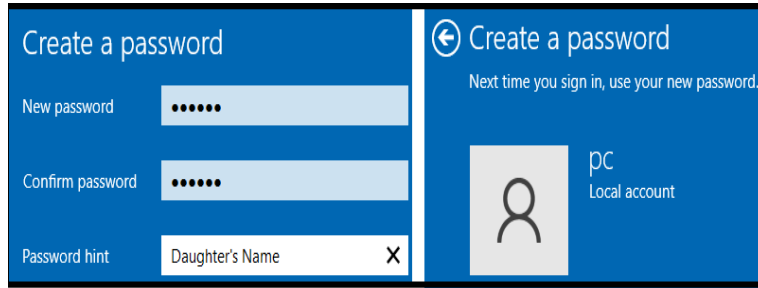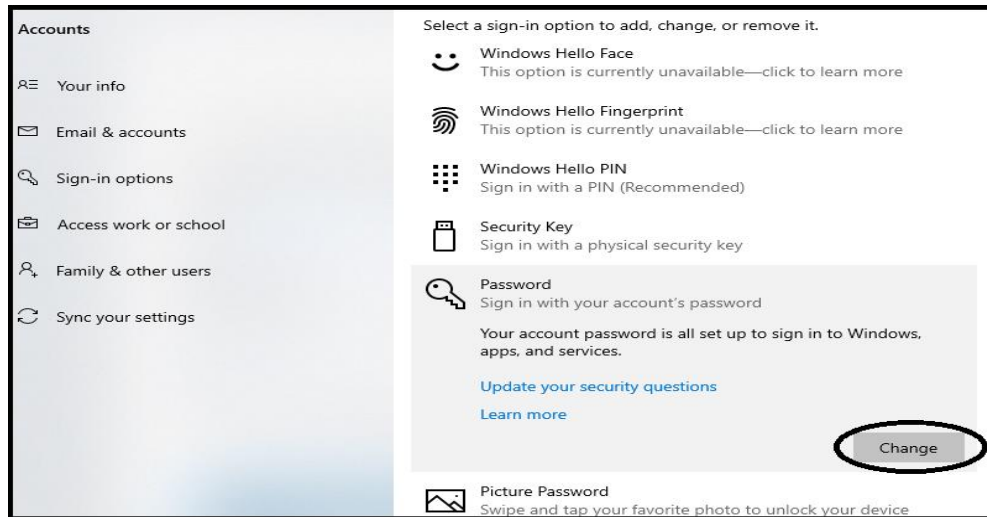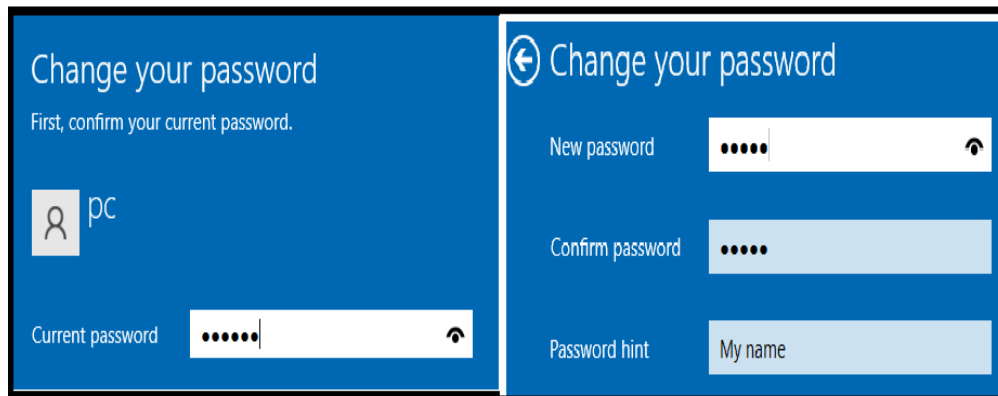In this Unit, we explored the critical role of software and cyber security in safeguarding digital systems and data. The Unit began by discussing the growing need for cyber security in the face of increasing cyber threats, including cybercrimes such as data theft, hacking, and identity fraud. The various types of malware, such as viruses, worms, ransomware, and spyware, were examined to provide a deeper understanding of potential threats.

The Unit then outlined the goals of cyber security, emphasising the importance of protecting sensitive information, ensuring system integrity, and maintaining user trust. Various cyber security techniques were introduced, including firewalls, encryption, and regular software updates, to help secure systems against threats.

Practical strategies for safer online behaviour were also discussed under tips for safe browsing, including recognising phishing attempts, using strong passwords, and enabling two-factor authentication. Hands-on activities provided students with practical experience, such as utilising Windows Security on Windows 10 to scan for threats, enabling two-step verification for Gmail, and password-protecting a PC to enhance personal cyber security.

By understanding these principles and techniques, students are equipped with the foundational knowledge and skills necessary to navigate and protect themselves in the digital world effectively. This Unit not only emphasises the technical aspects of cyber security but also highlights the importance of adopting secure habits in everyday digital interactions.

4.3 Learning Outcomes

Now that you have finished studying this Unit, you should be able to:

- Comprehend the importance of cyber security in protecting data, systems, and networks from various cyber threats.
- Recognise and describe different types of malware, including viruses, worms, trojans, ransomware, and spyware.
- Articulate the primary goals of cyber security, such as ensuring data confidentiality, integrity, and availability.
- Implement practical tips for safe browsing to minimise the risk of online threats and enhance personal cyber safety.

- Perform the steps to enable two-step verification on a Gmail account to enhance account security
- Set up and manage password protection on a Windows 10 PC to prevent unauthorized access

4.4 Glossary

- **Cybersecurity:** The practice of protecting systems, networks, and data from digital attacks, unauthorised access, and damage.
- **Cybercrime:** criminal activities carried out using computers or the internet, such as hacking, identity theft, and online fraud.
- **Malware:** malicious software designed to harm, exploit, or otherwise compromise computers and networks.
- **Encryption:** The process of converting plaintext data into ciphertext to prevent unauthorised access.
- **Antivirus Software:** Software designed to detect, prevent, and remove malware.
- **Two-Factor Authentication (2FA):** An additional layer of security that requires not only a password and username but also something that only the user has on them, such as a smartphone.

4.5 Sample Questions

4.5.1 Objective Questions

1. The need for cyber security is to provide security against the following:
   a) Cyberattacks   b) Cyber-terrorists c) Malware   d) All

2. _____ is a way to damage, steal and spy the information on the networks
   a) Encryption b) Cryptography   c) Cyber Attack   d) Digital Signature

3. Attackers generally target the IP address of the end user using ____?
   a) Websites   b) Emails   c) Web Pages   d) Tracking

4. Expand Malware _____
   a) Multiple Hardware b) Malicious Software c) Multifunction Software d) None

5. SQL Injection is a Code used of attacking _____

a) Hardware   b) Database/Website   c) System   d) HTML

6. Which of the following is anti-virus software?

a) McFee   b) Kaspersky c) Norton   d) All

7. Name the legal form of hacking _____

a) Ethical   b) Non_Ethical   c) Cracking   d) Hack

8. What type of software is McAfee?

a) Virus   b) Antivirus   c) Malware   d) Editing Software

9. We should install _____ on our computer to protect from viruses

a) disc cleanup   b) Backup   c) Antivirus   d) disc Defragmenter

Answers

1. All 2.Cyber Attack 3. Websites 4.Malicious Software 5.Database/website

6. All 7.Ethical 8.Antivirus 9.Antivirus

4.5.2 Short Answer Questions

1. Why do we need cyber security?
2. Define cybercrime?
3. What is a firewall?
4. What is encryption?
5. List the different antivirus software.
6. What is the goal of email spoofing?
7. What do you mean by authentication?

4.5.3 Long Answer Questions

1. Discuss the advantages of cyber security.
2. Draw the neat diagram of the CIA and explain in detail.
3. Discuss how to safeguard your data from unauthorised access.
4. What is steganography, and how is it different from cryptography?

4.6 Suggested Learning Resources

Belapure, Sunit, and Nina Godbole. Cyber Security: Understanding Cybercrime, Computer Forensics, and Legal Perspectives. Wiley, 2011.

Brooks, Charles J., and Christopher Grow. *Cyber Security Essentials.* Wiley, 2018.

Chwan-Hwa (John), David, and Irwin. *Introduction to Computer Networks and Cyber Security.* CRC, 2016.

"Cybersecurity Skilling Program - EICTA." 24 Apr. 2023, https://ifacet.iitk.ac.in/cybersecurity-skilling-program/.

Graham, J., and Olso. *Cyber Security Essentials*. Auerbach Publications, 2016.

Rhodes, M. *Information Security: The Complete Reference.* McGraw Hill Education, 2013.

Whiteman, Michael, and Herbert Mattord. *Principles of Information Security.* Cengage, 2021.

Unit-5: MS Word

Structure

5.0 Introduction
5.1 Objectives
5.2 MS Word
        5.2.1 Quick Access Toolbar
        5.2.2 Creating a Document
        5.2.3 Saving a Document
        5.2.4 Closing the Document
        5.2.5 Open an Existing Document
        5.2.6 Exiting the word Application
        5.2.7 Editing a Document
        5.2.8 Selecting a Text/Object
        5.2.9 Copying/Pasting text or an Object
        5.2.10 Moving Text
        5.2.11 Find & Replace Text
        5.2.12 Checking Spelling & Grammar
        5.2.13 Table in MS Word
        5.2.14 Printing a Document
        5.2.15 Let Us Sum Up
5.3 Learning Outcomes
5.4 Glossary
5.5 Sample Questions
5.6 Suggested Learning Resources

5.0 Introduction

Notwithstanding a person's location or line of work, written communication has always been the greatest and most efficient form of communication. Sometimes it's easier for us to write something down than to say it aloud. Often, we would much rather communicate with our far-off friends and family just through writing. Sometimes, writing down our emotions is an easier way for us to communicate them than speaking about them. Writing down any message, whether official or informal, is the most effective way to deliver. A word processor can be used to write

reports, advertisements, brochures, newsletters, cover letters, resumes, books, directories and websites, among others.

Word processor is a computer program that facilitates performing the following functions:

- Typing text
- Correcting grammatical and spelling errors
- A preview of the text that has been typed in
- Providing a range of font sizes and styles
- Aligning text inside margins

The following are word processing programs that are often used:

- Microsoft Word.
- WordStar.
- WordPerfect;
- ExpertWriter

5.1 Objectives

The objectives of this Unit are as follows:

- Navigate the Microsoft Word interface, including the Quick Access Toolbar.
- Create, save, open, and close Word documents efficiently.
- Edit text effectively, including selecting, copying, pasting, and moving text.
- Utilise the Find and Replace function for efficient editing.
- Check for spelling and grammar errors to ensure accuracy.
- Create and format tables to organise information.
- Print documents in the desired format.

5.2 MS Word

Introduction to MS Word

A computer system utilises software, such as a word processor or Microsoft Word, to generate, edit, and format computer programs while executing certain tasks. Currently, we are utilising Microsoft Word 2013, a user-friendly word processing product that facilitates the creation

of various personal and professional documents, ranging from simple greeting letters to comprehensive hospital reports. Microsoft Word possesses a desktop publishing tool that enhances the visual appeal and readability of documents. MS Word can be utilised for the following purposes:

- Implementing styles, motifs, and colours that enhance the visual appeal and provide a sense of confidence to the page and text.
- Generating emails with several recipients that are customised without necessitating extensive typing.
- Preserve and reutilise the elements, including cover pages and side designs.
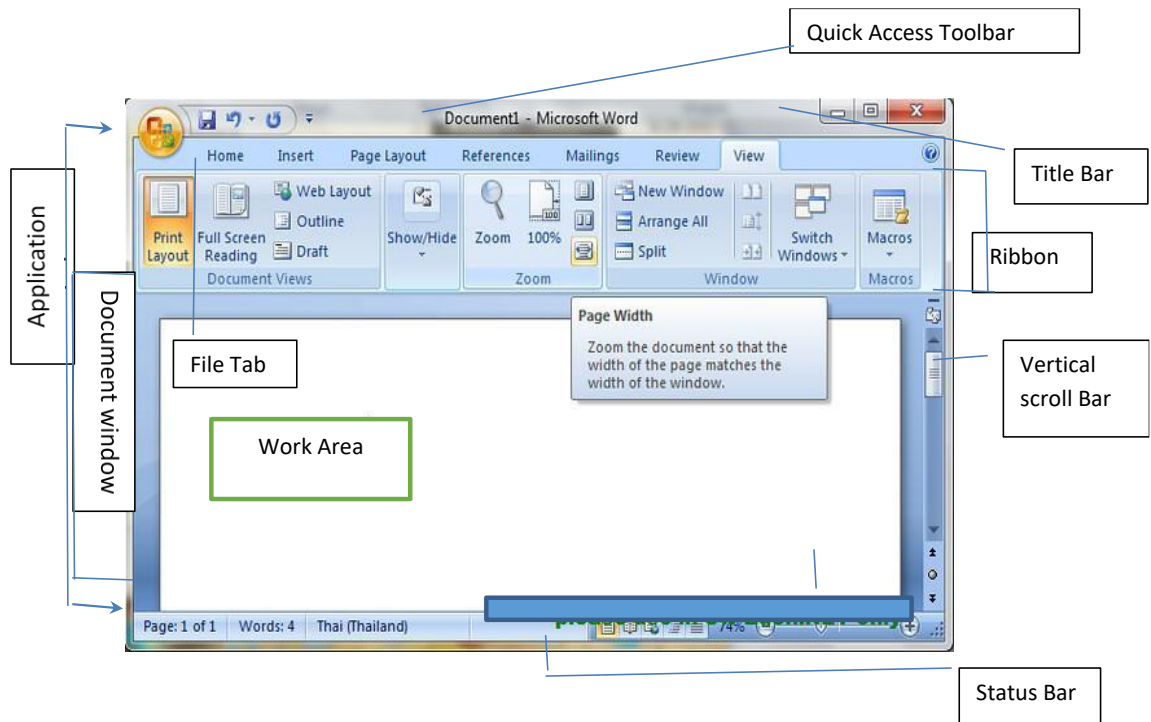- Document Preview and Printing
- Saving, editing, and formatting

Figure 1 Component of Microsoft Windows

The Microsoft Word application has two windows:

1. Application Window: Larger Window
2. Document Window—Smaller Window

The application window is used for communication with the MS Word program, while the document window is used for editing, typing, and formatting text.

5.2.1 Quick Access Toolbar

This Toolbar is located next to the Word icon, which is helpful to provide easy entry to frequently Use keys like Save, Undo, and Redo. We can add/remove commands using drop-down arrow in Quick Access Toolbar.

- Tabular Title: The toolbar at the top of the Word window is useful in displaying the present (active) document (Document 1) along with the name of the application in the centre.
- Ribbon: In MS Word 2010, Ribbon contains eight tabs, which are Insert, Home, Mailing, Review, and View; Page Layout; References; and PDF, which has the different icon and different command along with their respective utility and purpose Tabs and Groups.
- Home: This tab includes editing, privacy, styles, paragraphs, clipboards, and fonts.
- Insert: This tab contains text, headings and footers, tables, illustrations, links, and symbols.
- Page layout: Themes, Page setup, Page background, Paragraph, and Arrange are all available on this tab.
- References: Table of Contents, Footnotes, Citation & Bibliography, Captions, Index, and Table of Authorities—are all located on this tab.
- Mailings: Create, Start Mail Merge, Write & Insert Fields, Preview Result, and Finish are all available on this tab.
- Review: The features on this tab include proofing, language, comments, tracking, comparison, and protection.
- View: There are document views, show, zoom, window, and macros on this tab.
- Work Area:- The area where the Typing, Editing and formatting can be done which is also called as Blank Area.
- Vertical Scroll Bar: This bar is helpful in scrolling the page up & down, which can move from top to bottom, and their also exists a horizontal scroll bar, which can move the page from right to left or vice versa.
- Status bar: This bar, located at the bottom of the application window, gives support to several program features and shows details about the current document.

Figure 2 The Status Bar

Word automatically places the Spelling and Grammar Check, Macro Recording, Word Count, and Page Number indicators at the left end of the status bar. By clicking on any of these indicators on the left, you can quickly view the status of that feature and bring up the relevant pane or dialog box.

Word automatically places the Zoom Slider, Zoom Level, and View Shortcuts controls at the right end of the status bar. The three main document content views have buttons on the View Shortcuts toolbar. The controls for Zoom Slider and Zoom Level let you change the current document's magnification. There are five views in which we can show the content of the active document: Draft version, synopsis view.

5.2.2 Creating a Document

To create a document in Word, the following steps need to be done:.

• Select New from the File Tab. Then, select Blank Document.

Finally, click the Create button
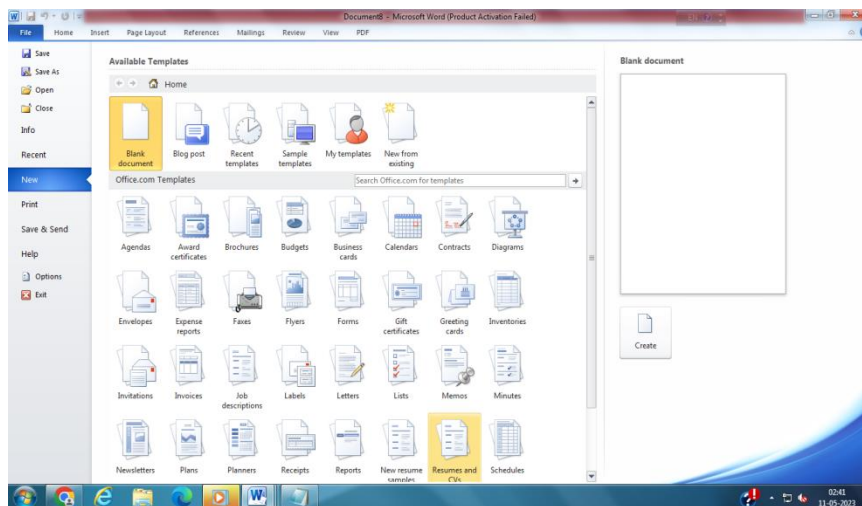
Figure 3 Creating a Blank Document

- ● Or Press Ctrl+ N from the keyboard.
- ● Or to create a document, just right-click on Desktop and select New Microsoft Word Document.
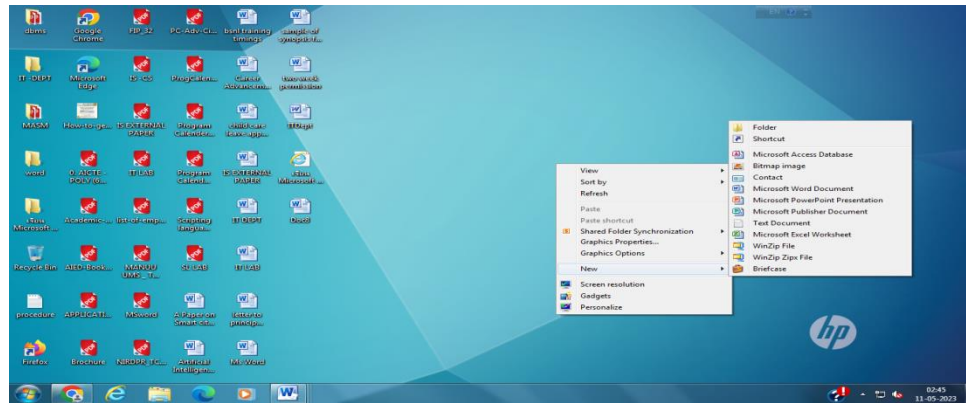
Figure 4 Creating a Blank Document from Desktop

5.2.3 Saving a Document

To save a document in Word, follow the given steps below.

In the word document, click on file Tab select save option this below window appears
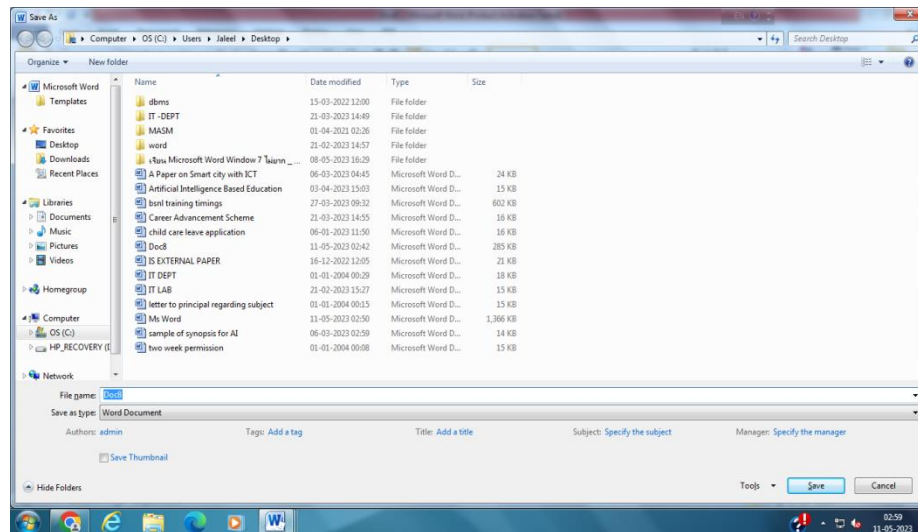
Figure 5 Saving a Document

- Type the name of the document in File Name and click on Save Button.

- Or press Crl+S key in the Open Document

- Or in the Quick Access Toolbar, click in the File Name field, enter the document's name, then press the Save button. Or press Crl+S key in the Open Document

- Or in Quick access Toolbar, click on save Button

Save Button
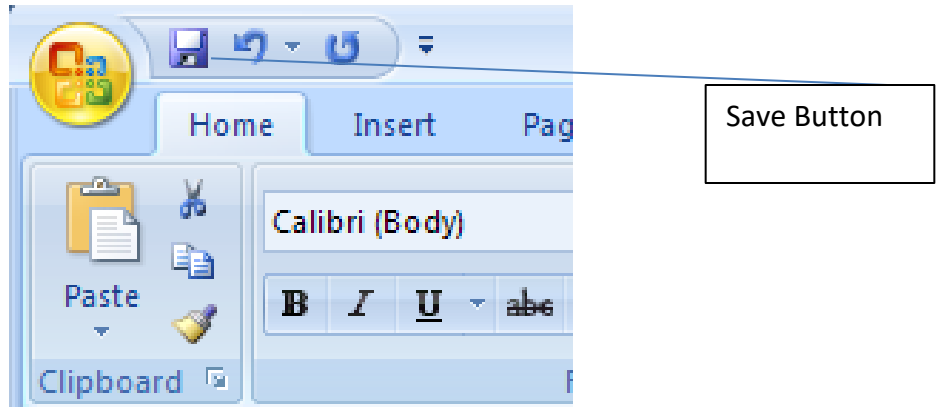
Figure 6 Saving from Quick Access Toolbar

5.2.4 Closing the Document

To close the Existing open document, click on File Tab and select close option
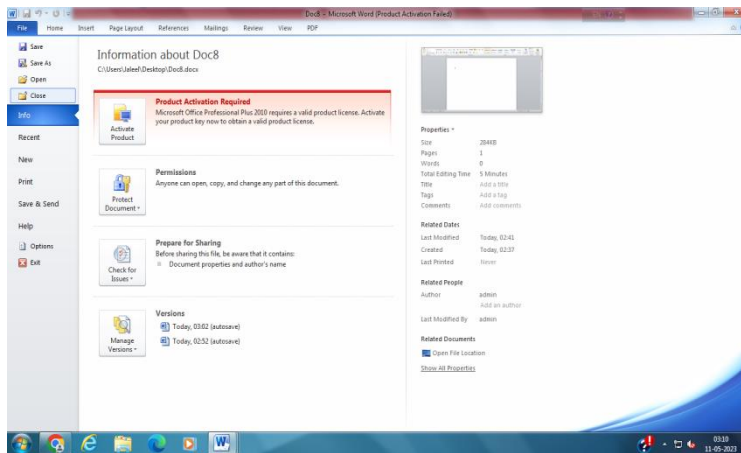
Figure 7 closing Document

Or close the document from the title bar, which has a symbol ✖ in the top right corner of the document.

Check your progress:

1. The shortcut key for saving a document in MS Word is _____.

5.2.5 Open an Existing Document

If the document that was created earlier exists in the system, then it can be opened anytime based on the user requirement. Take these actions to open the current document. Select Open by clicking on the File Tab
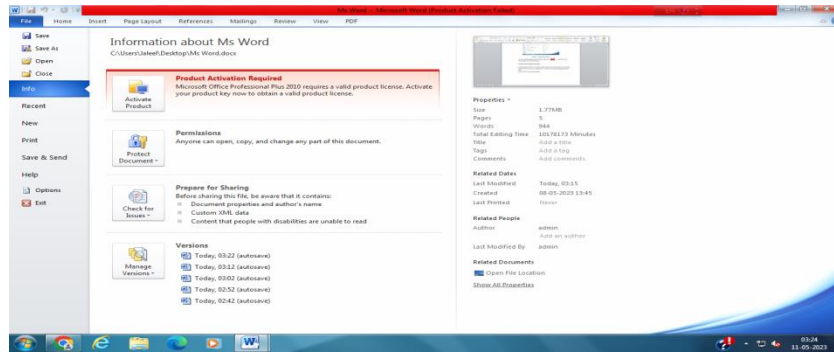
Figure 8 opening an Existing Document

This command will open the document that existed in the system, or Click ctrl+ O from the keyboard.

5.2.6 Exiting the word Application

Exit Word refers to closing all documents within the Microsoft Word application and ending the program. This can be accomplished

1. Select File from the menu, then select Exit.

2. Alternatively, click the Close button from the document or press the function key Alt+F4.

5.2.7 Editing a Document

Editing a document means making corrections or modifications to the existing document, which include inserting, deleting, copying, moving, finding, or replacing a text or image in a particular document.

Editing can be done first based on the selection of the text so the selection can be done in the following ways:

5.2.8 Selecting a Text/Object

By applying a keyboard and mouse to select text:

1. Click and drag: This method is arguably the easiest to use and most widespread. It involves clicking and dragging the mouse in any direction.
2. [Shift]+arrow: Hold down the [Shift] key while hitting the up, down, and right arrow keys, respectively, to move one character or one line at a time.
3. [Shift]+[Home] | [End]: Selecting everything in the current line from the insertion point to the left border requires pressing [Shift] + [Home].
   In the same vein, everything from the insert point to the final character on the right is selected when you press [Shift]+[End].

4. Double-click: Double-click the word that is now selected. Word will make selections to the left and right of the pointer until it comes across a space. 4

5. Triple-click: This allows you to choose The undo action is used to cancel the last action performed on the document, which requires clicking on Undo button or pressing ctrl+z.

6. Margin+click: Press and hold the left margin to select a line in its entirety. Click once you've seen the insertion cursor change to an arrow pointer. By doing this, the current line will be chosen. It's also possible to hit [Home]+[Shift]+[End].

7. Margin+click and drag: This method of selection is comparable to the one that came before it. Holding down the mouse button while dragging allows Word to pick several lines, even paragraphs. Once you stop dragging.

8. [Ctrl]+A: Selecting the full document is done by pressing [Ctrl]+a.

9. [Ctrl]+click: Holding down [Ctrl] while clicking anywhere in the sentence will select the entire sentence, not just a line.

10. Click+[Shift]+click: Click at one end of a text block to pick it. Next, depress the [Shift] key.

11. [Alt]+drag: This key combination chooses a block that is vertical. Click and drag upward or downward while keeping down [Alt]. (First, you have to hit [Alt].)

12. Selection+[Ctrl]+selection: Choose the first text block to choose two non-contiguous blocks of text. Next, use [Ctrl] to select two or more non-contiguous areas while you choose the next, and the next, and the next.

13. [Ctrl]+[Shift]+[Right arrow] | [Left arrow]: Depending on whether you press the right or left arrow, respectively, this combination allows you to choose to move from the current location to the right or left of the current word.

14. [Ctrl]+[Shift]+[Up arrow] | [Down arrow]: Depending on whether you press the up or down arrow, this combination moves you from the current location to the start or finish of the current paragraph.

15. [Page Up] | [Page Down] + [Alt] + [Ctrl] + [Shift]:-This is another tricky keyboard combination that moves the cursor from the current insertion point to either the start or the end of the window that is currently visible to us on screen.

You can undo the most recent action you took on the document by clicking the Undo button or by pressing Ctrl+Z.
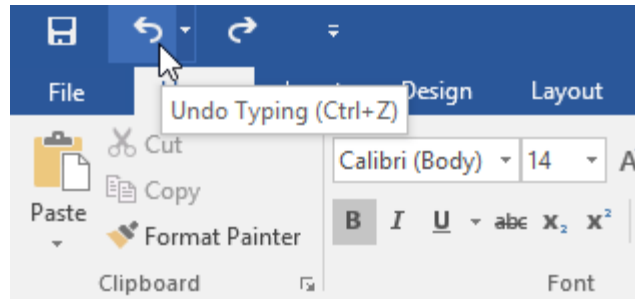
Figure 9 Undo operation

Redo is used when we have done with undo operation in the Document
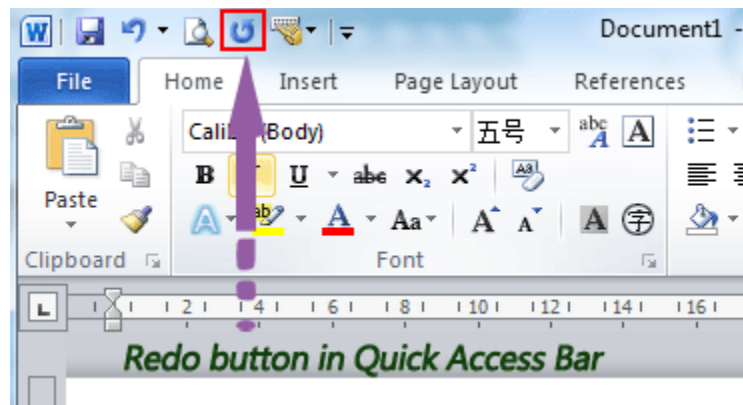
Figure 10 Redo Operation

Or press ctrl+y from the Keyboard.

5.2.9 Copying/Pasting text or an Object

Copying means keeping the text in its original location and copying the same text to some other location, which helps in saving time and effort of typing.

When we want to create multiple copies of the same text at some different location, just cut, copy, and paste the following.

	Cut	Copy	Paste
From the Home tab, select these buttons:			
Use these shortcut keys to access:	Ctrl+X	Ctrl+C	Ctrl+V

Right-click your selection and then choose one of these commands:	Cut	Copy	Paste

Figure 11 Cut, Copy, Paste methods

5.2.10 Moving Text

Just like copying text, moving is also one of the options where text or object can be moved from one document to another.

- Select the text found in the document and perform the cut operation, and in the other document just do the paste.
- Or select the text and perform the Ctrl+x operation from the keyboard, and in the other document, press Ctrl+v with the keyboard.

5.2.11 Find & Replace Text

Microsoft Word has the find and replace feature, which helps in searching and replacing the text. Use the Find function to look for and examine each instance of a specific term or phrase to make sure the content in your documents is accurate and consistent. Word finds all instances of the characters you input in the search box at the top of the page, highlights them all, and shows them on the Results page.

KEYBOARD SHORTCUT: Type Ctrl+F to open the search window.

ScreenTips provides the page number and heading name of the search result that appears when we point to a particular search result on the Results page. To go straight to a certain place in the document, simply click on one of the search results.

When we point to a search result on the Results page, a ScreenTip displays the number of the page on which that result appears and the name of the heading preceding the search result. You can click a search result to move directly to that location in the document.
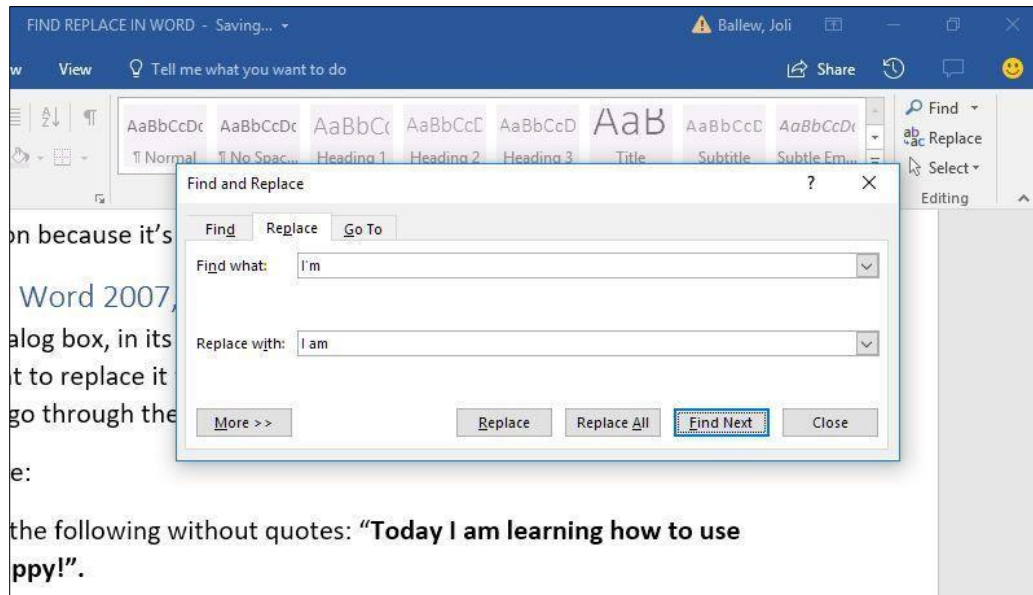
Figure 12 Find And Replace

KEYBOARD SHORTCUT:- Press Ctrl+H to display the Replace page of the Find And Replace dialog box.

In this window we can see the Find and Replace dropdown, whereby typing the above Shortcut Ctrl+H will display the above window where we can type find what and replace it with a new word.

5.2.12 Checking Spelling & Grammar

Spelling and grammar evaluations are increasingly included in word processing applications like Word; thus, publications with these kinds of mistakes are likely to reflect poorly on their authors.

The following three tools are available in Word to assist you in removing spelling and grammar errors:

AutoCorrect: This feature automatically applies formatting depending on text cues, fixes common spelling and grammar mistakes, and substitutes mathematical symbols for text codes. A list of commonly misspelled words and their proper spellings is pre-installed in AutoCorrect. We can add a word to the list in the AutoCorrect Correct dialog box if we frequently misspell it and AutoCorrect doesn't fix it. Clicking the Undo button before entering anything else or pointing to the bar that appears beneath the word and then clicking Undo will undo the correction if you

purposefully input a term that is on the AutoCorrect list and don't want to accept the AutoCorrect alteration.

▪ Error indications Word uses red wavy underlines to highlight potential spelling issues, green wavy underlines to indicate potential grammar errors, and blue wavy underlines to indicate potential formatting errors. When a word or phrase is underlined, you can right-click on it to see recommended edits and connections to proofing resources.

▪ Grammar and spelling checker

Click the Spelling & Grammar button in the Proofing group on the Review tab to check the spelling and grammar of a selected text or the full document. After that, Word navigates through the selection or the document, displaying the Grammar or Spelling panes in the event that it finds a possible issue.

KEYBOARD SHORTCUT - To begin checking the grammar and spelling from where you are in the document, press F7.

3.1 Check spelling and grammar

The grammar and spelling of your files can be checked by any Microsoft Office product. This is where we may discover the spelling and grammar option in Microsoft Word 2013.
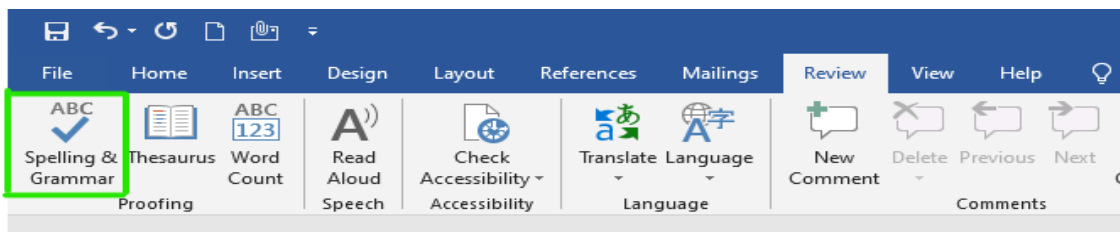
Fig 13 Spell Check

To begin the spelling and grammar checker and view the results in the Spelling and Grammar task pane, click Review > Spelling & Grammar (or press F7).

Check spelling and grammar all at once

The spelling and grammar options are displayed in the task pane located on the right side of your document:

i) Use Word's suggestions to correct the problem: Choose a word from the list of suggested words and click Change to use it to correct the error. (If you are aware that you have used this misspelled or misused word repeatedly in the document, you may also select Change All to avoid having to deal with it every time it appears.)

ii) Add a dictionary entry: Click Add if the word is one you actually use and we want Word—as

well as ALL of the Office programs—to recognize.

iii) Disregard the word Perhaps you should disregard this misspelled word (for whatever reason).

Check spelling and grammar automatically

It could be preferable for us to check spelling and grammar as you type because you can make the necessary adjustments and revisions as you write, rather than waiting until your paper is finished.
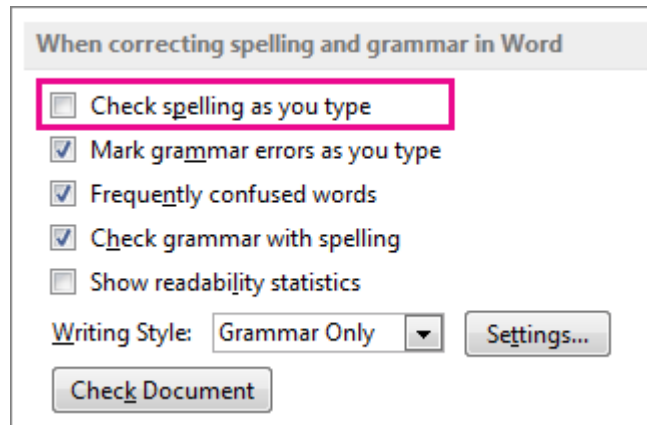
Fig 14 spelling & Grammar Check Automatically

1. First, select File > Options > Proofing to enable (or disable) automatic spell and grammar checkers.

2. The image above illustrates our options for automatically checking spelling, grammar, or both. We can also select other alternatives, such as contextual spelling.

3. We have the option to hide grammar and spelling mistakes in our open document under Exceptions. If we leave the options unchecked but leave any of the options above checked, those settings will be retained in all of your future documents.

5.2.13 Table in MS Word

Presenting information in tables

A table is made up of horizontal rows and vertical columns. Though some tables just contain column headings or simply row headers, each column and each row can be identified by its heading. Data (text or numeric information) can be stored in the box located at the intersection of each column and row.
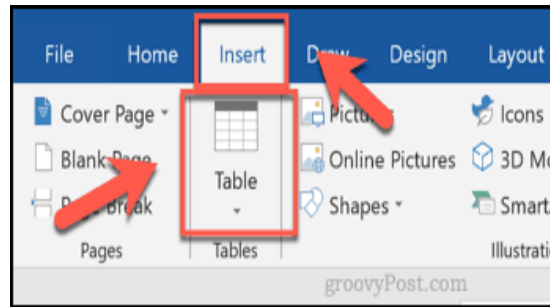
Fig 15 Inserting Table

Creating Table

There are two ways to create a blank table in a Word document: Firstly, click Table on the Insert tab. This will generate a table with up to six columns and five rows.

The Insert Table menu and gallery will now be shown.

To depict columns and rows of cells, the gallery uses a straightforward grid. By pointing to a grid cell, you may make a live preview of the potential table and see which cells would be included in the table that would be formed by clicking that cell.

The grid's empty table, which is the breadth of the text column, is inserted when a cell is clicked. With every row being one line high and every column having the amount of columns and rows you specified in the grid, the table has the column of equal width
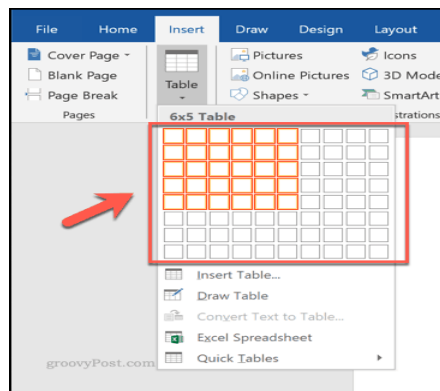
Fig 16 Inserting 6x5 Table

The basic methods for manipulating a table or its contents are as follows:

Insert rows or columns

1. Word 2013 has a new feature that makes it simpler than ever to add a single row or column to an already-existing table. All you have to do is indicate where you want to add a row or column by pointing to the table's left edge or top. As you get

closer to a potential insertion point—which comes after any existing row or column—a grey insertion indicator with a plus symbol is displayed. Click to insert the row or column where instructed when the insertion indicator goes blue.

2. Choose the same number of already-existing rows or columns next to the area where you wish to insert one or more rows or columns. Click Insert, and then click Insert again on the window

3. Mini Toolbar that displays
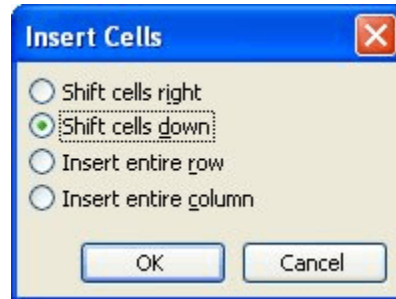
Fig 17 Insert Cells

Add cells In order to add one or more cells to a table, first decide how many to add next to the desired location. Next, click the Rows & Column dialog box launcher to open the Insert Cells dialog box. Finally, choose which way to move the existing cells to make room for the new Eliminate table components, Choose a row, column, or set of cells.

On the Mini Toolbar that appears, or in the Rows & Columns group, select Delete, then Delete Cells, Delete Columns, Delete Rows, or Delete Table.

Adjust a table's whole size After pointing at the table, drag the size handle that shows up in the bottom-right corner of the screen. To keep the table's original aspect ratio, drag the size handle while holding down the Shift key.

Adjust a single row or column To manually set the width of a column, drag its right boundary to the left or right. Alternatively, double-click the border to resize it to the smallest width that still accommodates the content.

To manually adjust a row's height, drag its bottom border up or down. Alternatively, you can use the instructions in the cell size group on the Layout tool tab to control row height and column width.

To move the table, either point to it and drag the move handle that shows up in the top-left corner to a new spot, or use the Cut and Paste tools found in the Clipboard group on the Home tab.

Merge Cells - By selecting the desired cells to combine and clicking the combine cells button in the merge group on the layout tool tab, you may create cells that span multiple columns or rows. For instance, we can merge every cell in the row to form a single merged cell that fills the table width if we want to centre a title in the first row of a table.
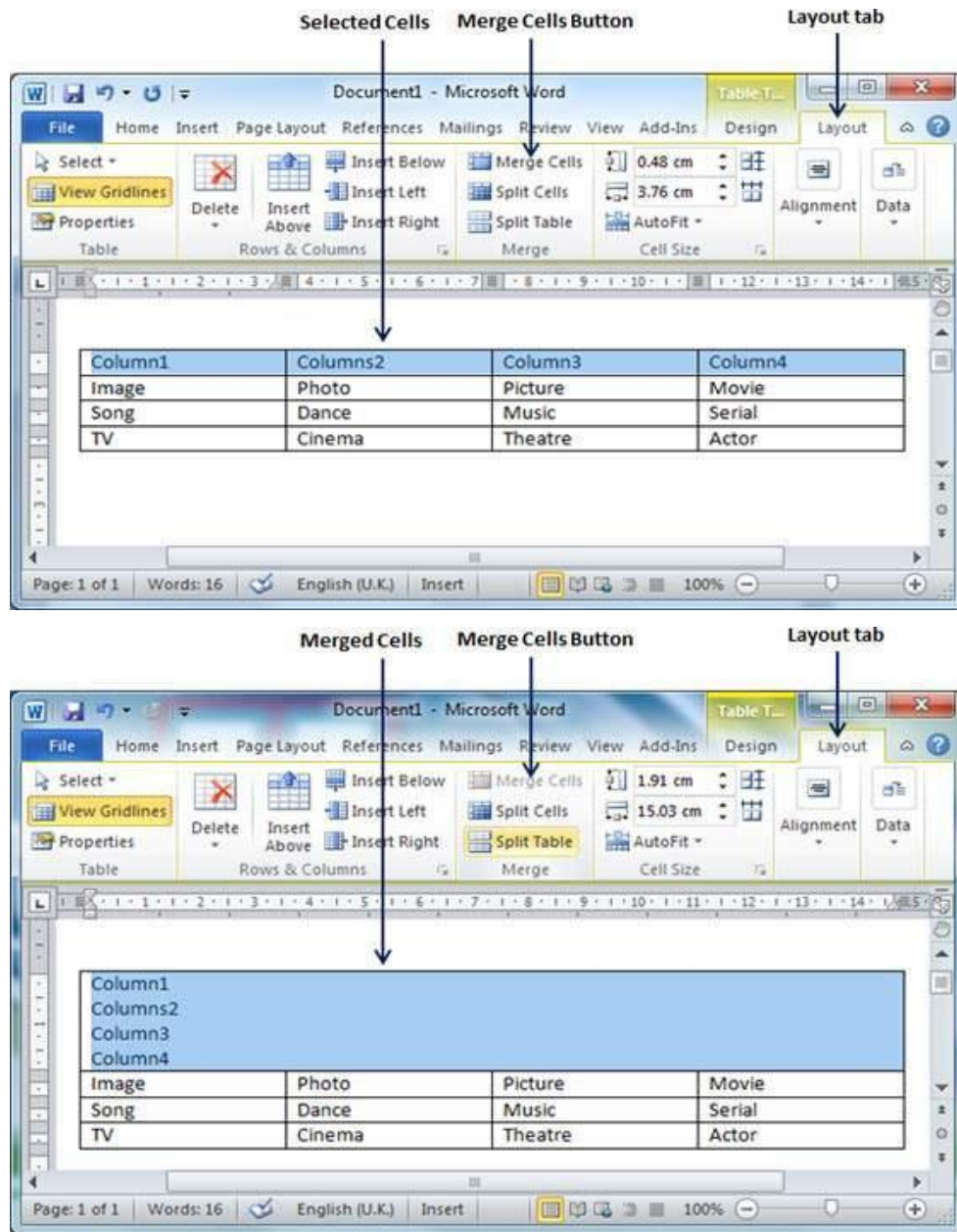
Fig -18 Merge Cell

Split Cell - To divide a single cell into numerous cells, click the Split Cells button in the Layout tool tab's Merge group. Next, enter the desired number of columns and rows for the cell's division.
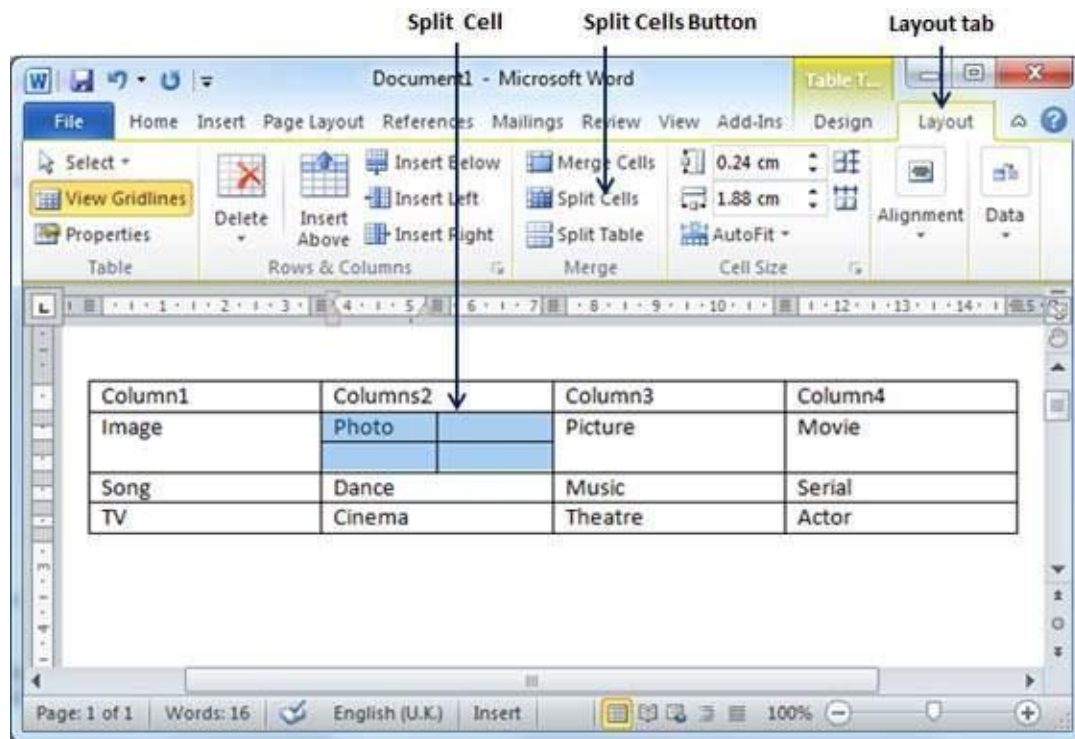
Fig 19 – Split cell

Formatting tables

Click the Split Cells button in the Merge group of the Layout tool tab to split a single cell into multiple cells. Next, specify how many rows and columns you want the cell divided into.
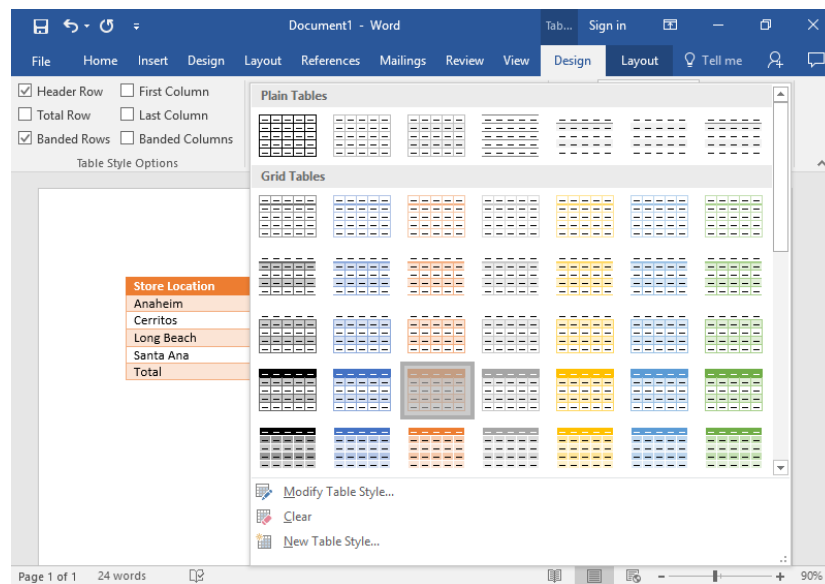
List tables, grid tables, and plain tables have their own sections in Word 2013's Table Styles collection

5.2.14 Printing a Document

Document Printing Show the Backstage view's Print page. This document is two pages long, as you can see. Since the page will not be printed, the colour backdrop is not shown in the preview pane. To view the list of installed printers, click the printer that is currently in use in the Printer area. Select the printer you wish to send the document to by clicking on it in the Printer list. Take note that when you use a different printer, the options offered on the Print page may vary

Select a file and the print option will show in the window below on the Microsoft Word home page
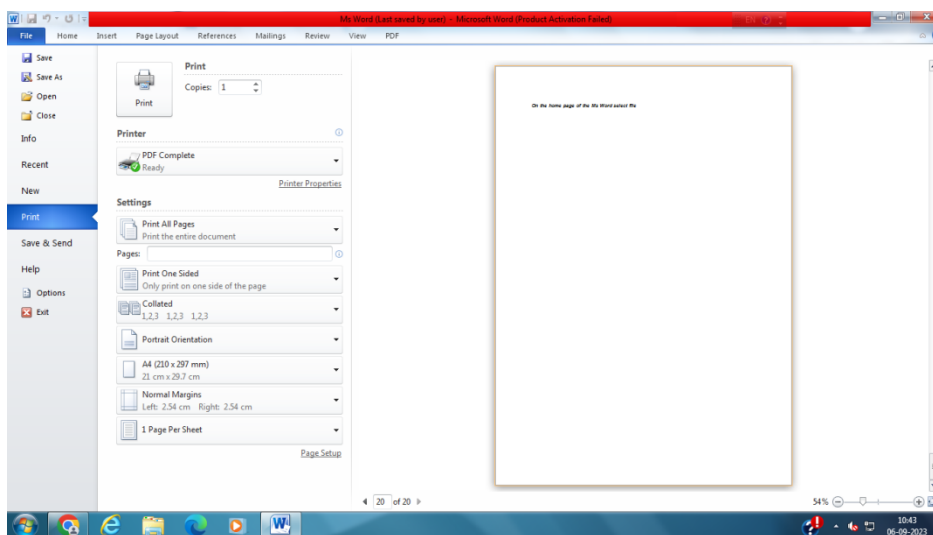
In this window, select printing copies and also select the printer option with which printer we want to print the document. In the same document, select *Print all pages* or select the odd/even page that we want to print. Click on print. Keyboard Shortcut – Ctrl+p.

5.2.15 Let Us Sum Up

In this Unit, we explored the key features and functionalities of **Microsoft Word**, a powerful word processing tool. You learnt how to use the **Quick Access Toolbar**, which lets you access frequently used commands quickly and easily, helping you streamline your work.

We showed you how to **create a new document**, **save your work**, and properly **close a document** or **exit the application**. You also practiced how to **open existing documents**, allowing you to continue working on previously saved files.

We focused on editing tools, teaching you how to **select text or objects**, **copy and paste content**, and **move text** to reorganise your document. You used the **Find & Replace** feature to search for specific text and make changes efficiently. You also learnt to use the **Spelling & Grammar** tool to eliminate errors and ensure your writing is polished.

We guided you through creating and formatting **tables**, enabling you to organise information effectively. Finally, we showed you how to prepare your document for **printing**, ensuring that your work is ready for professional output.

5.3 Learning Outcomes

Now that you have completed the Unit, you should be able to:

- Identify the purpose and key features of MS Word as a word processing tool.
- Recognise and use basic interface elements, such as the ribbon, toolbar, and document area.
- Create new documents, type and format text, and make basic edits to content.
- Use tools to change font styles, sizes, colours, and apply text alignment, bullets, and numbering.
- Utilize spell check, find and replace, and basic keyboard shortcuts to enhance productivity.
- Save documents in different formats and share them using print or email options.
- Add tables, images, and shapes to enhance document content visually.

5.4 Glossary

1. **Ribbon:** The toolbar at the top of the MS Word interface that contains commands and tools organised into tabs, such as Home, Insert, and Layout.
2. **Document Area:** The blank space in MS Word where you type, edit, and format text. It represents the content of the document.
3. **Font:** The style or design of text characters. Examples include Arial, Times New Roman, and Calibri.
4. **Alignment:** The positioning of text within the margins of a document, such as left, right, centre, or justified alignment.

5. **Margins:** The blank spaces around the edges of a document where no text or graphics are displayed.

6. **Header and Footer:** Sections at the top (header) and bottom (footer) of a page where information such as titles, dates, or page numbers can be added.

7. **Page Layout:** The settings that determine the appearance of a page, including orientation (portrait or landscape), size, and margins.

8. **Spell Check:** A tool that checks the spelling of words in a document and suggests corrections for misspelt words.

5.5 Sample Questions

5.5.1 Objective Questions

1. Shortcut for creating a document?

   a. Ctrl+N   b. Ctrl+C   c. Ctrl+v   d. Ctrl+x

2. Why Ctrl+H is used?

   a. open Find   b. open Replace   **c. both a & b** d. None of the above

3. To open a document, what shortcut is used?

   a.Ctrl+N   **b.Ctrl+O**   c. Ctrl+v   d. Ctrl+x

4. What is Split Cell? (**Ans:** It is a function used to divide a single cell into numerous cells)

5. What is Merge Cell? (**Ans:** It is a function used to combine multiple cells to create cells that span several rows or columns.)

6. Shortcut of Creating Table in Ms Word? (**Ans:** Insert > Table > Insert Table)

7. Shortcut for Search in Ms Word?

   a. Ctrl+N   b. Ctrl+O   c. Ctrl+v   **d. Ctrl+F**

8. Why ctrl+x is Used_____?

   a. Cut   b. copy   c. Paste   d. Cut &Copy

9. Ctrl+p used for_____?

   a. Cut   b. copy   c. Paste   **d. Print**

10. For Undo and Redo shortcut_____?

   a Ctrl + Z. Use Ctrl + Y to undo a previously made action.

   b Ctrl + p . Use Ctrl + Y to Redo a previously made action.

   c Press and hold Z. Use Ctrl + p to undo a previously made action.

d Use Ctrl + x. Use Ctrl + Y to undo a previously made action.

5.5.2 Short Answer Questions

1. Describe the process of copying, cutting, and pasting text in MS Word using the clipboard.
2. Explain the purpose of the ribbon in MS Word.
3. Explain the importance of the Spell Check feature in MS Word.
4. What are the steps to save a document in MS Word?

5.5.3 Long Answer Questions

1. What are the steps in finding spelling & grammar mistakes?
2. Write down steps for creating, opening, and editing documents.
3. Write down steps for printing documents.
4. Write down steps for selecting a document.
5. Write down steps for formatting tables.

5.6 Suggested Learning Resources

1. Lambert Joan, *Microsoft Word 2016 Step By Step*, PHI Learning Pvt Ltd, 2016.
2. Peter, Weverka, *Microsoft Office 365 All-in-One for Dummies*, Wiley, 2023.

Unit-6: MS PowerPoint

Structure

6.0 Introduction

MS PowerPoint is among the most prevalent tools for crafting visually compelling presentations. Created by Microsoft, it is a robust software tool that assists individuals and organisations in articulating their ideas effectively through slides. PowerPoint offers essential tools for students crafting class projects, educators developing lesson plans, and professionals presenting business pitches to generate engaging visual content.

This Unit familiarises you with the fundamentals of PowerPoint, emphasising its intuitive interface and functional attributes. The process commences by acclimating learners to the workspace, including the ribbon, slide pane, and assorted tools. It progressively instructs users on the creation, formatting, and enhancement of slides utilising text, images, animations, and transitions.

Mastering PowerPoint is not merely crafting slides but effectively conveying concepts in a structured and compelling manner. By learning the essential aspects, novices will acquire the confidence to produce presentations that are both professional and innovative, establishing a basis for more advanced competencies in the future.

6.1 Objectives

Up on completion of this Unit, you will be able to:

- Explain PowerPoint Basics.
- Create a New Presentation.
- Design slides, add media and use animations and transitions.
- Collaborate and share designs of PowerPoint.
- Deliver effective presentations.

6.2 MS PowerPoint

6.2.1 Introduction

PowerPoint is a powerful presentation software developed by Microsoft. It is a widely used software for creating slide-based presentations. It helps users convey ideas effectively through a mix of text, images, and multimedia elements.

Why Use PowerPoint?

- Easy to use for visual storytelling.
- Enhances communication with images, charts, and multimedia.
- Professional look and feel with customisable templates.

6.2.2 Getting Started

Opening PowerPoint

- On a Windows computer:
    1. Click the **Start** menu.
    2. Search for "PowerPoint."
    3. Click on the PowerPoint icon to open the program.
- On a Mac:
    1. Open the **Applications** folder.

2. Locate and double-click the PowerPoint icon.

Overview of the Interface

- **Ribbon:** The ribbon at the top of the screen contains all the tabs (Home, Insert, Design, Transitions, Animations, Slide Show, Review, and View) where you can find various tools and options.

- **Slides Pane:** On the left side, you will see the slides pane, which shows a thumbnail view of all the slides in your presentation. You can click on a slide to navigate to it.

- **Slide Area:** The main area in the middle is the slide area, where you can design and edit each slide. It contains palceholders that are predefined containers on a slide that accommodate text, photos, movies, and various other items.

- **Notes Pane:** At the bottom, there's a notes pane where you can add notes to each slide. These notes won't be visible to your audience during the presentation but can be useful for you as the presenter.
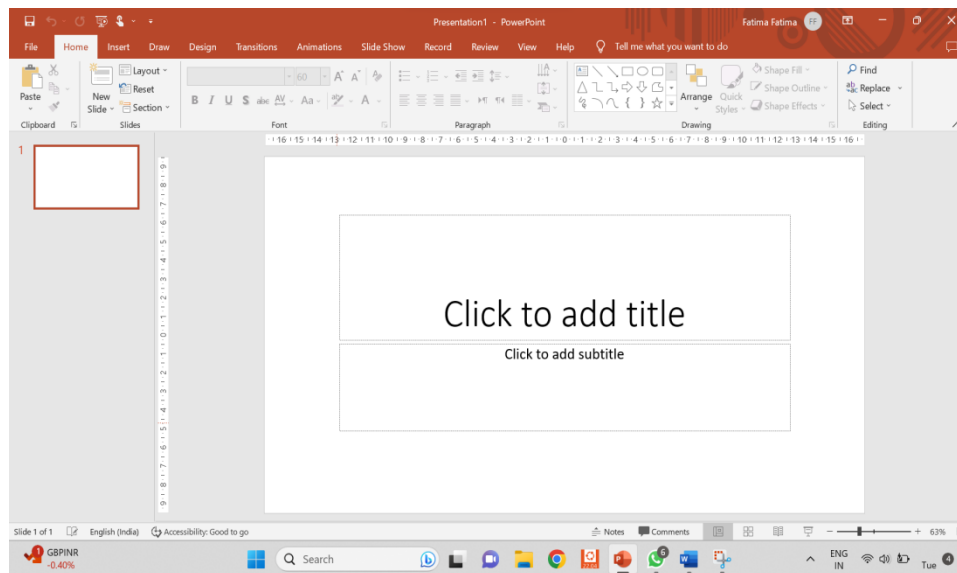
6.2.2 Creating a new Presentation

Choosing a Template

- Templates save time by providing pre-designed slides.
- Steps:
  1. Go to *File > New*.
  2. Browse the available templates.
  3. Select a template or choose a blank presentation for full customisation.

110
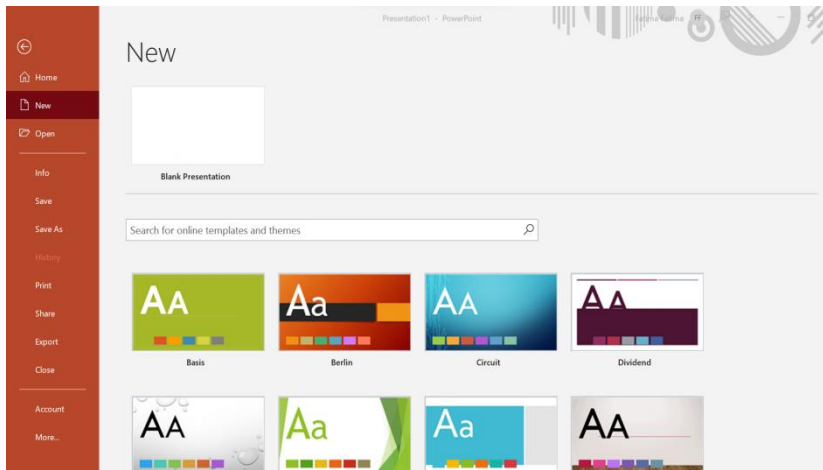
Adding Slides

- Click *New Slide* under the *Home* tab to add a slide.
- Right-click on an existing slide in the slides pane to duplicate, delete, or rearrange slides.
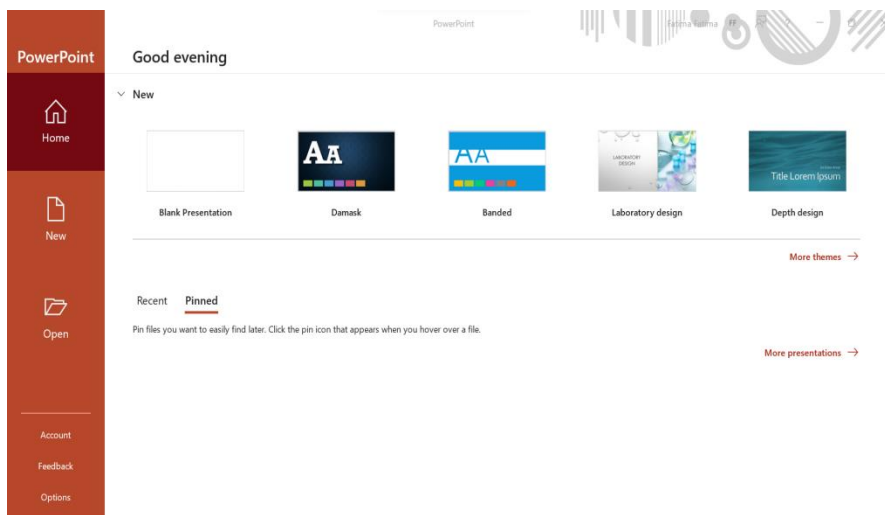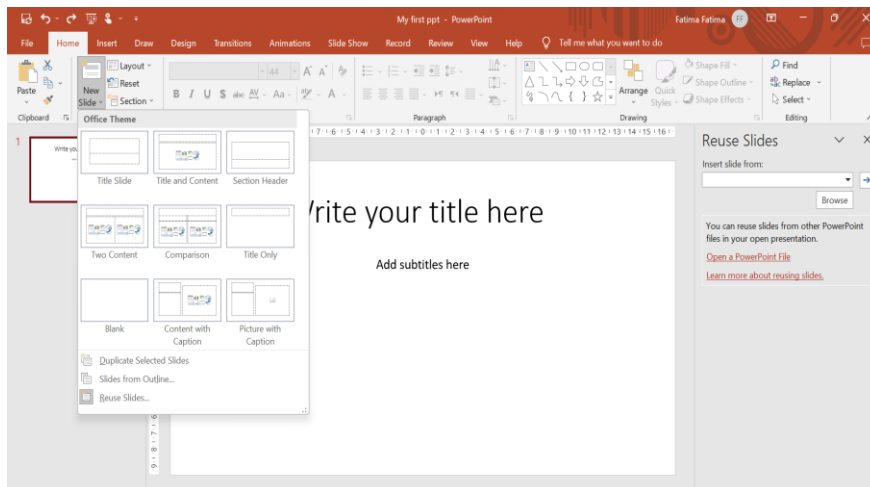
Slide Layouts

PowerPoint provides several predefined layouts to help you organise your content. Some common layouts include:

- **Title Slide**: Used for the presentation title.
- **Title and Content**: Ideal for adding bullet points, images, or charts.
- **Two Content**: Useful for comparing two sets of information side by side.

6.2.4 Adding Content

Inserting Text

- Click on placeholders that say "Click to add text."
- Use the formatting toolbar to:
  - Change fonts and font sizes.
  - Adjust text alignment (left, centre, or right).
  - Apply bold, italics, or underline for emphasis.
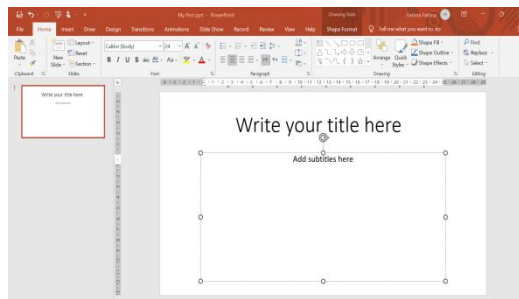
Adding Images and Shapes

- Steps to insert an image:
  1. Go to the *Insert* tab.
  2. Select *Pictures* to upload from your device.
- To add shapes:
  1. Go to the *Insert* tab.
  2. Click *Shapes* and choose from rectangles, circles, arrows, etc.
- Drag and resize the elements using their borders or corner handles.
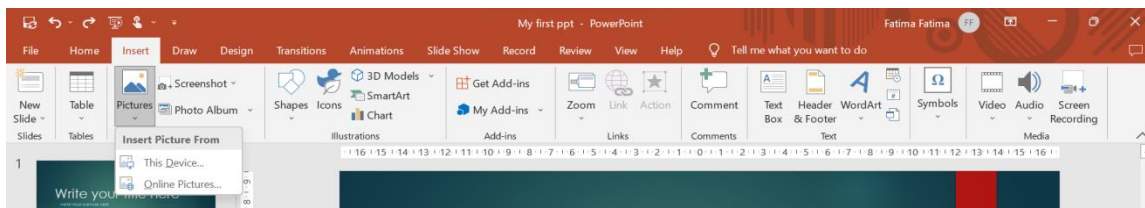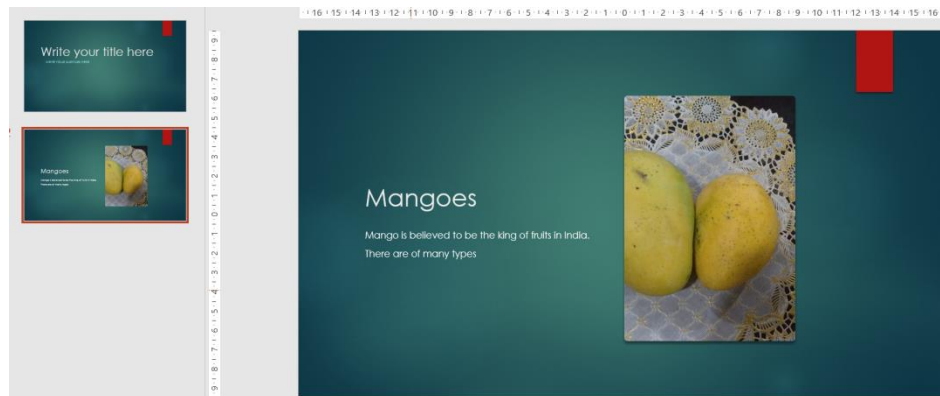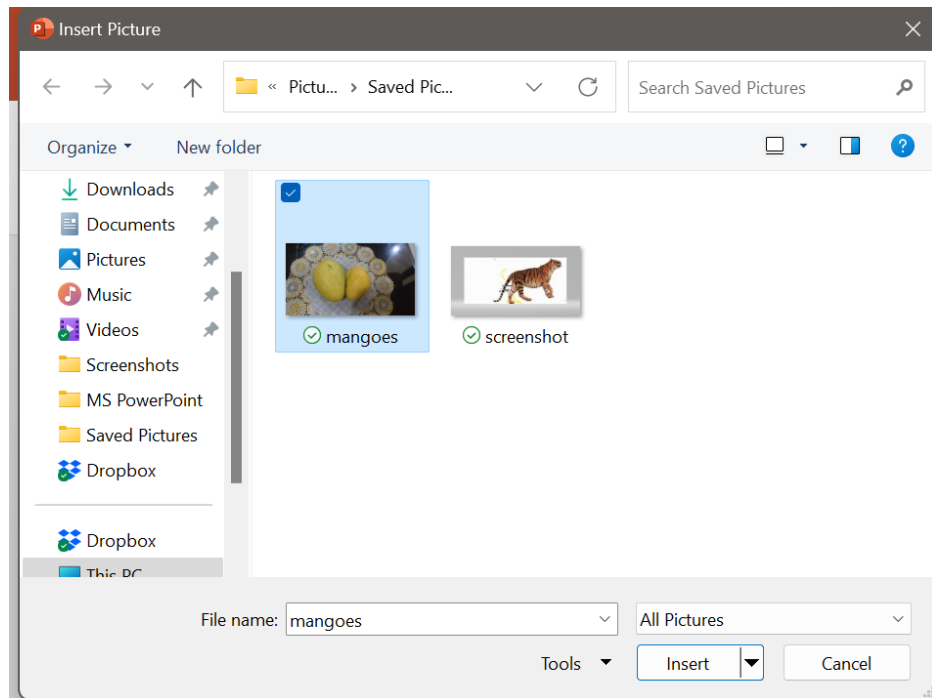
Using Charts, Tables, and SmartArt

- **Charts**: Visualise data by inserting bar, line, or pie charts.

- **Tables**: Organise data in rows and columns for clarity.

- **SmartArt**: Use graphic diagrams like flowcharts or hierarchy charts.

6.2.5 Design and Formatting

Themes and Layouts

- Themes provide a consistent look across all slides.

  - Access themes from the *Design* tab.

  - Click on a theme to apply it to the presentation.

- Layouts organise placeholders for text and visuals.

  - Use the *Layout* button under the *Home* tab to switch layouts.
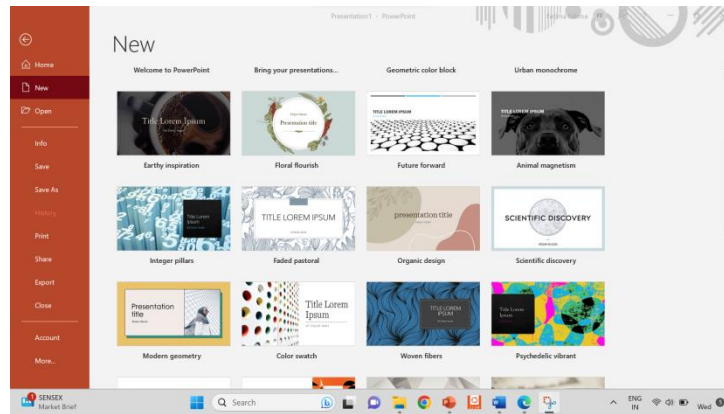
Customizing Slides

- Change the background by clicking *Format Background* in the *Design* tab.
- Experiment with font styles and colours to match your theme.
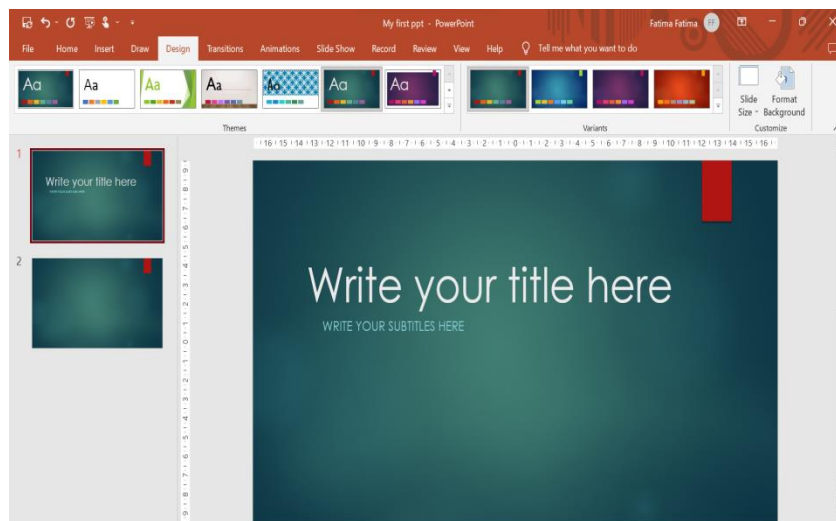
To ensure uniformity of typefaces and visuals throughout your presentation, modifications can be made in a single location—the Slide Master—resulting in their application to every slide. In other words, Slide Master helps you get consistent formatting across all slides. To get Slide Master view, navigate to the View tab and pick Slide Master.

6.2.6 Using Animations and Transitions

Transitions

- Create smooth shifts between slides.
- Steps:
    1. Go to the *Transitions* tab.
    2. Select a transition effect like Fade or Wipe.
    3. Adjust the duration and apply the effect to all slides.

114

Animations

- Animate text or objects for emphasis.
- Steps:
    1. Go to the *Animations* tab.
    2. Select an animation effect like Fly In or Appear.
    3. Use the animation pane to control order and timing.

Check your progress:

1. What feature in MS PowerPoint allows you to apply consistent formatting across all slides?

_____

6.2.7 Adding Speaker Notes

Speaker Notes in PowerPoint are textual annotations or reminders added to slides to help presenters during a presentation. These notes are not visible to the audience but serve as a private guide for the presenter, especially during a live or recorded session.

Key Features of Speaker Notes:

1. **Private Reference:** Displayed only in Presenter View, allowing the presenter to see them while the audience views the slides.
2. **Detailed Support:** Useful for adding extended explanations, statistics, or scripts to accompany the slide content.
3. **Customisable:** Text in the Notes Section can be formatted to improve readability.

Uses of Speaker Notes:

- Remembering key points without overcrowding slides.
- Preparing detailed scripts for important presentations.
- Serving as a checklist during presentation delivery.
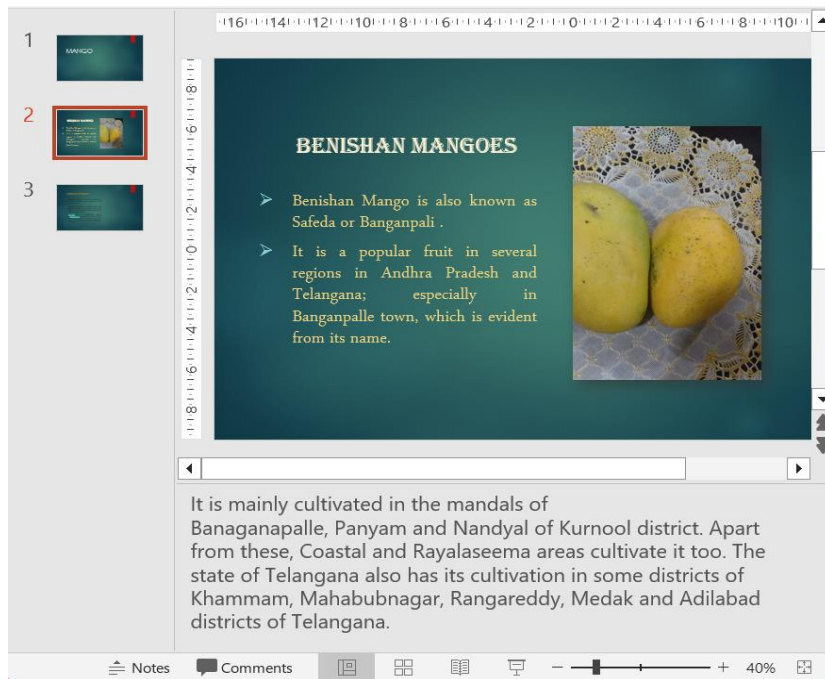
Adding Audio to Slides

Including audio in PowerPoint can enhance your presentation by adding voiceovers, sound effects, or background music. The following is a step-by-step guide to adding audio to your slides: You can add 2 types of audio:

● **Pre-recorded Audio**: Files like MP3 or WAV from your computer.

● **Voice Recording**: Record directly in PowerPoint using a microphone.

Adding Pre-recorded Audio

1. **Navigate to the Slide**: Open the slide where you want to add the audio.

2. **Go to the Insert Tab**:
   ○ Click on the **Insert** tab in the Ribbon.

3. **Select Audio**:
   ○ Choose **Audio on My PC** under the **Audio** option.
   ○ Browse and select your audio file.

4. **Adjust the Audio Icon**:
   ○ An audio icon will appear on the slide. Drag it to a suitable position.

5. **Customise Playback Settings**:
   ○ Click the **Playback** tab (appears after selecting the audio icon).
   ○ Options include:
      ■ Play Automatically or On Click.

116

- ■ Loop Until Stopped.
- ■ Hide During Show (if you don't want the audio icon to appear).

Recording Your Voice in PowerPoint

1. **Go to the Insert Tab**: Select **Audio > Record Audio**.
2. **Name Your Recording**: Enter a name for your audio file.
3. **Start Recording**: Click **Record** and speak into the microphone.
4. **Stop and Preview**: Click **Stop** when finished and **Play** to review your recording.
5. **Save the Recording**: Save it to the slide by clicking **OK**.

Syncing Audio with Slide Content

- Use the **Animation Pane** to synchronise animations and transitions with audio playback.
- Adjust the start time and duration of audio in the Playback settings.

Tips for Using Audio Effectively

- Keep audio clear and concise.
- Use professional or royalty-free background music.
- Test the audio volume and playback settings before presenting.
- Avoid overloading your presentation with unnecessary sound effects.

6.2.9 Saving and Sharing

Saving Your Presentation

1. Click *File > Save As*.
2. Choose a location on your computer or cloud storage.
3. Save as a .pptx file for editing or a .pdf file for sharing.

Sharing Options

- Share your presentation via:
  - Email: Attach the file directly.
  - Cloud Platforms: Use OneDrive or Google Drive for easy access and collaboration.
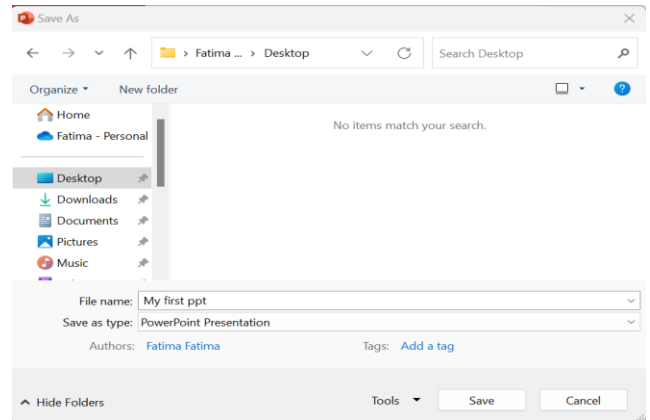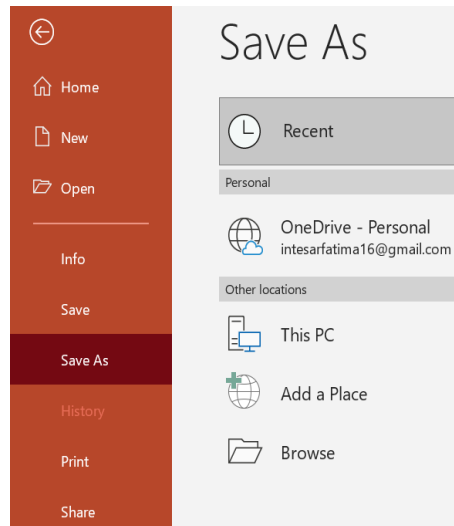
6.2.10 Tips for Effective Presentations

Preparing Your Presentation:

- **Know Your Audience**: Comprehend the identity of your audience and their expectations regarding your presentation. Customise your material to align with their requirements and preferences.

- **Define your objective**: Explicitly articulate the objective of your presentation. Are you providing information, attempting to persuade, or seeking to entertain? This will direct your content and presentation style.

- **Organise Your Content:** Organise your presentation with a distinct introduction, body, and conclusion. Commence with an introduction, proceed to the principal arguments, and close with a summary or a call to action.

- **Formulate an Outline**: Prior to constructing your slides, formulate an overview of your presentation. This will assist you in maintaining focus and guarantee that you address all significant aspects.

Creating Your Slides:

- **Maintain Simplicity**: Refrain from overloading your presentations with excessive text or an abundance of photos. Strive for a minimalist design that emphasises the essential elements.

- **Use high-quality Visuals**: Incorporate pertinent photos, charts, and graphics to enhance your communication. Ensure that the visuals are of superior quality and directly pertinent to the text.

- **Maintain Consistent Design**: Employ a uniform design throughout your presentation. Maintain uniformity in colour schemes, typography, and slide layouts to achieve a unified appearance.
- **Limit Text:** Utilise bullet points and concise sentences to communicate your topic effectively. Refrain from using lengthy paragraphs, as they may inundate your audience.
- **Employ Contrasting Colours**: Select colours that provide strong contrast to guarantee the readability of your text and pictures. Utilise dark text on a bright background or the inverse.

Delivering Your Presentation:
- **Practice**: Rehearse your presentation multiple times to become familiar with the content and timing. Practice in front of a mirror, record yourself, or present to a friend for feedback.
- **Engage with Your Audience**: Make eye contact with your audience and use open body language. Ask questions and encourage interaction to keep them engaged.
- **Use a Strong Opening**: Start with a strong opening to grab your audience's attention. This could be an interesting fact, a question, or a brief anecdote related to your topic.
- **Speak Clearly and Confidently**: Speak at a steady pace and articulate your words clearly. Project confidence through your tone of voice and body language.
- **Use Visual Aids Effectively**: Refer to your slides when necessary, but avoid reading directly from them. Use them to complement your speech, not replace it.
- **Manage Your Time**: Keep an eye on the clock and ensure you stay within the allocated time for your presentation. Practice timing yourself during rehearsals.
- **Handle Questions Gracefully**: Be prepared for questions from the audience. Listen carefully, respond thoughtfully, and if you don't know the answer, it's okay to admit it and offer to follow up later.

Post-Presentation:
- **Summarise Key Points**: End your presentation with a summary of the key points you've covered. This helps reinforce the main takeaways for your audience.
- **Provide a Call to Action**: Encourage your audience to take a specific action based on your presentation. This could be visiting a website, signing up for a newsletter, or implementing your suggestions.
- **Collect Feedback**: Gather feedback from your audience to understand what went well and where you can improve. This can be done through surveys, direct questions, or informal conversations.

● **Reflect and Improve**: Reflect on your presentation experience and identify areas for improvement. Use the feedback you received to enhance your skills for future presentations.

6.2.11 Let Us Sum Up

PowerPoint is an essential tool for creating visually appealing presentations that communicate ideas effectively. This Unit introduced the basics of PowerPoint, starting with its interface, key components, and how to create a new presentation. The primary purpose of PowerPoint is to design slideshows for professional, academic, or personal contexts, making it a vital resource for engaging audiences and enhancing communication. To begin using PowerPoint, users must familiarize themselves with its interface. Opening the application and creating a new presentation introduces key components like the Ribbon for tools, the Slides Pane for navigation, the Slide Area for content creation, and the Notes Pane for adding supplementary details.

Templates are an essential feature for achieving a polished and consistent design. Users can select from a variety of pre-designed templates to set the tone and style of their presentation, ensuring a cohesive visual identity. Creating a presentation involves adding new slides and selecting suitable layouts for content organization. Formatting text and maintaining a clean design are crucial for clarity and professionalism, helping to convey messages effectively.

PowerPoint allows the insertion of diverse media types, including images, videos, audio, and charts, to enhance engagement. Proper formatting and placement of media elements can significantly improve the visual appeal of a presentation. Animations and slide transitions add dynamism to presentations. Users can animate objects and apply transitions between slides thoughtfully, ensuring these enhancements support rather than distract from the presentation's core message.

Delivering a presentation effectively requires preparation and the use of tools like presenter view and slide timings. Engaging with the audience and maintaining a steady flow ensure the message is conveyed successfully. PowerPoint supports collaboration through co-authoring features and sharing options. Presentations can be shared in multiple formats, making it easier to work with teams and deliver content across various platforms.

6.3 Learning Outcomes

Now that you have completed the Unit, you will be able to:

- Describe the primary uses and significance of PowerPoint in creating visual presentations.
- Confidently navigate the PowerPoint interface, including the Ribbon, Slides Pane, Slide Area, and Notes Pane.
- Create a new presentation from scratch, choose and apply appropriate templates, and add new slides with suitable layouts.
- Format text, insert images, videos, and other media to create visually appealing slides.
- Use presenter view and manage slide timings to deliver a polished and engaging presentation.
- Implement strategies to engage with the audience and present confidently.

6.4 Glossary

- **Slide**: A single page within a PowerPoint presentation that can contain text, images, charts, and other elements.
- **Template**: Pre-designed layouts and styles that can be applied to a PowerPoint presentation to give it a consistent and professional look.
- **Transition**: An animation effect that occurs when moving from one slide to the next during a presentation.
- **Animation:** Effects applied to text, images, and other objects on a slide to make them move or appear in a specific way.
- **Slide Layout:** The arrangement of placeholders on a slide, such as title, text, images, and other content elements.
- **Notes Pane**: An area at the bottom of the PowerPoint interface where the presenter can add notes that won't be visible to the audience.
- **Placeholder:** Pre-formatted containers on a slide that hold text, images, videos, and other objects.

● **Presenter View**: A special display mode that allows the presenter to see their notes, the current slide, and upcoming slides on their screen, while the audience sees only the current slide.

6.5 Sample Questions

6.5.1 Objective Questions

1. What is the primary purpose of PowerPoint?
   a. **To create slide presentations**
   b. To edit photos
   c. To manage databases
   d. To write code

2. Which of the following can be used to apply a consistent design throughout a PowerPoint presentation?
   a. Slide Layout
   b. Transition
   c. **Template**
   d. Animation

3. How do you add a new slide to a presentation?
   a. Click on the Home tab and then click on New Slide
   b. Click on the Insert tab and then click on Picture
   c. Right-click on an existing slide and select Delete Slide
   d. **Click on the Design tab and then click on New Slide**

4. What is the function of the Notes Pane in PowerPoint?
   a. To create animations
   b. **To add speaker notes that are not visible to the audience**
   c. To insert images
   d. To apply transitions between slides

5. Which view allows you to see your notes while presenting to an audience?
   a. Slide Show View
   b. Normal View
   c. Reading View

d. **Presenter View**

6. What is the purpose of using transitions in a PowerPoint presentation?

    a. To format text

    b. **To create visual effects between slides**

    c. To insert charts

    d.   To manage slide layouts

7. What file extension does PowerPoint use to save presentations?

    a. .docx

    b. **.pptx**

    c.   .xlsx

    d. .pdf

6.5.2 Short Answer Questions:

1. Describe the process of creating a new presentation in PowerPoint.
2. What are the benefits of using a template in PowerPoint, and how can it improve the overall presentation?
3. Explain the purpose of the Notes Pane in PowerPoint.

6.5.3 Long Answer Questions:

1. Describe the Process of Creating a Professional PowerPoint Presentation from Start to Finish.
2. Discuss the various methods to create effective presentations.

6.6 Suggested Learning Resources

- "PowerPoint for Beginners | Step by Step Tutorial to Get Started." *YouTube*, https://www.youtube.com/watch?v=fACEzzmXelY.
- *Add Speaker Notes to Your Slides - Microsoft Support*. https://support.microsoft.com/en-us/office/add-speaker-notes-to-your-slides-26985155-35f5-45ba-812b-e1bd3c48928e.
- *Create a Presentation in PowerPoint - Microsoft Support*. https://support.microsoft.com/en-us/office/create-a-presentation-in-powerpoint-422250f8-5721-4cea-92cc-202fa7b89617.

Unit-7: MS Excel – 1

Structure

7.0 Introduction

Microsoft Excel 2019 is an easy-to-use yet powerful spreadsheet and graphics package. At its most basic level, Excel enables you to quickly produce numeric documents involving calculations. At a higher level, you can use it as a complete development tool catering to many complex requirements.

7.1 Objectives

By the end of this Unit, you will be able to:

- Understand the Interface of MS Excel.

- Create and Manage Spreadsheets.

- Enter and Format Data.

- Perform Basic Calculations.

- Work with Rows and Columns.

- Create Basic Charts and Graphs.

7.2 MS Excel – 1

7.2.1 Identifying the Interface
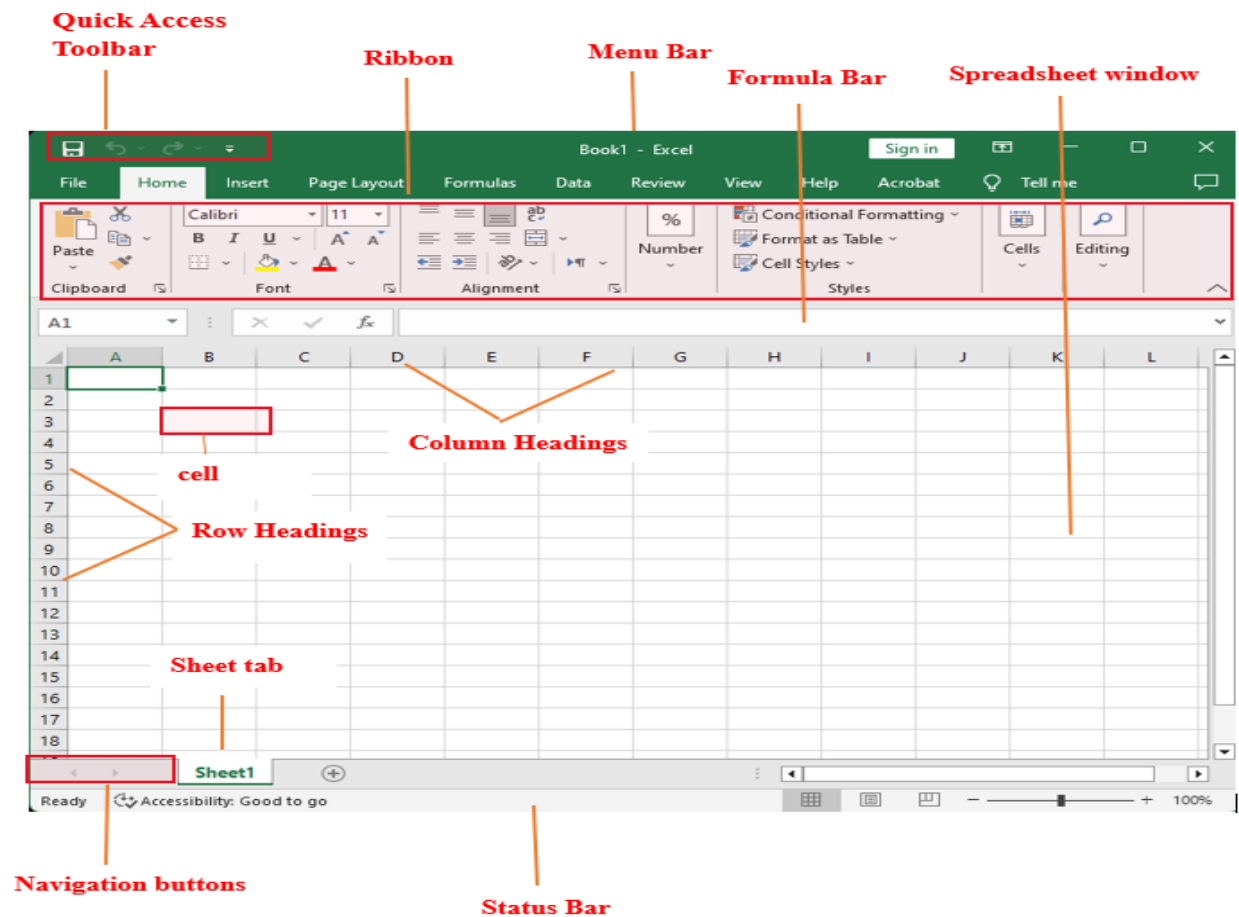
The Excel application is contained inside the Microsoft Office suite. To get started with MS Excel, open the Microsoft Office suite, and in it, click on MS. Excel. A blank spreadsheet gets opened. A spreadsheet is a tool in which data is organised in the form of rows and columns

Quick Access Toolbar: It contains tools that can be quickly accessed without having to move in and out of tabs. It popularly has the save, undo, & redo buttons on it. But the quick access toolbar can also be customised to add other buttons like print, spelling, sorting, etc.
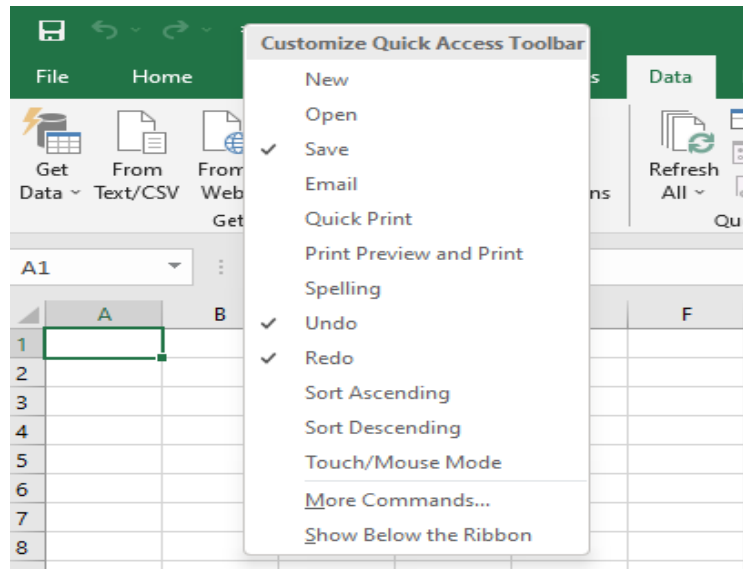
Ribbon: The ribbon encloses tabs like the File, Home, Insert tabs and their respective tools in groups. For example, when the Home tab is clicked, it shows number of tools in groupings like Clipboard, font, etc.

Menu Bar: The menu bar is at the top of the Excel window. It shows the name of the Excel file, and it also has the control buttons (minimise, maximise, & close) at the rightmost corner of it.

Formula Bar: The formula bar is just below the ribbon and is labelled as *fx.* It is used to enter a new formula or type an existing one.

Worksheet Window: The worksheet is the main area of the spreadsheet where data is stored in the form of rows and columns. Here, the data can be entered, analysed, manipulated, and stored for further reference.

Cell: A cell is a rectangular box in which data is entered. The data may be in the form of numbers or characters. A cell is an intersection of a row and a column, which represents its address, called the cell address. For example, cell A4 means 4th row and Ath column.

Column Headings: Each column has a heading represented as A, B, C, D, and so on.

Row Headings: Each row is represented by a number in the ascending order, like 1, 2, 3, 4, and so on.

Sheet Tabs: The sheet tab shows the sheet number. The + sign beside the sheet tab is used to add another sheet to the existing Workbook.

Navigation Buttons: The navigation buttons are used to move to another worksheet in an Excel workbook. A workbook by default contains at least three worksheets. Navigation buttons are used to display the first, previous, next, and last worksheets in the workbook.

Status Bar: The status bar shows the status of options that are selected on the worksheet. 'Ready' status means that, at the moment, no data manipulation is being done on the worksheet. When data is being manipulated, the status bar shows 'Enter' as status. By default, the status bar contains many options. By right-clicking the status bar, it can be customised to add/remove options.
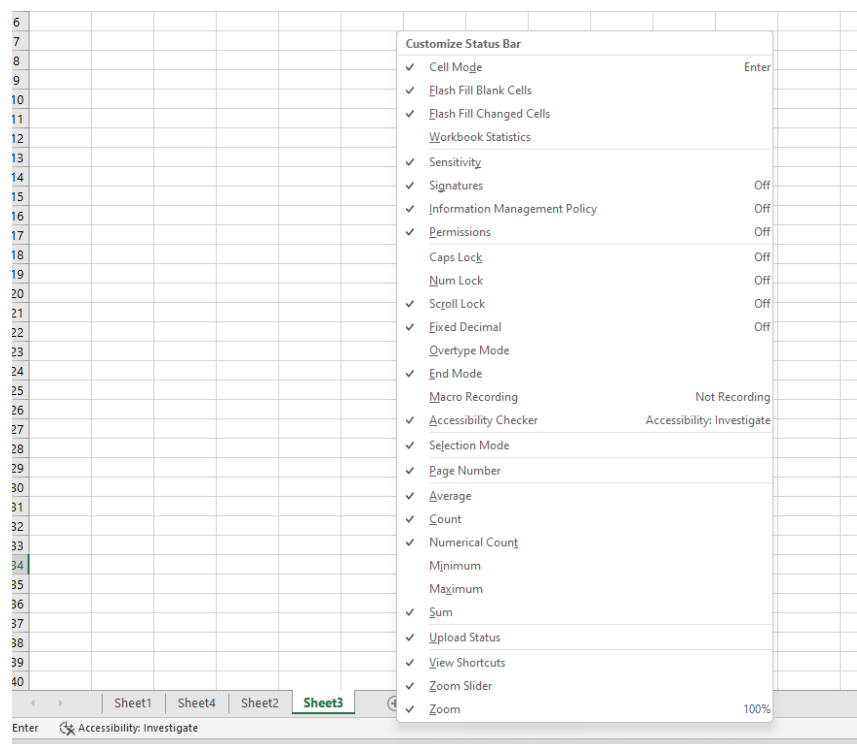
Cell References

Cell reference typically means the address of a cell. A cell reference is a combination of a number and an alphabet. The alphabet represents the respective column, and the number represents the respective row. For example, in the below figure, F4 means 4th row and F^{th} column. H7 means 7th row and h^{th} column.
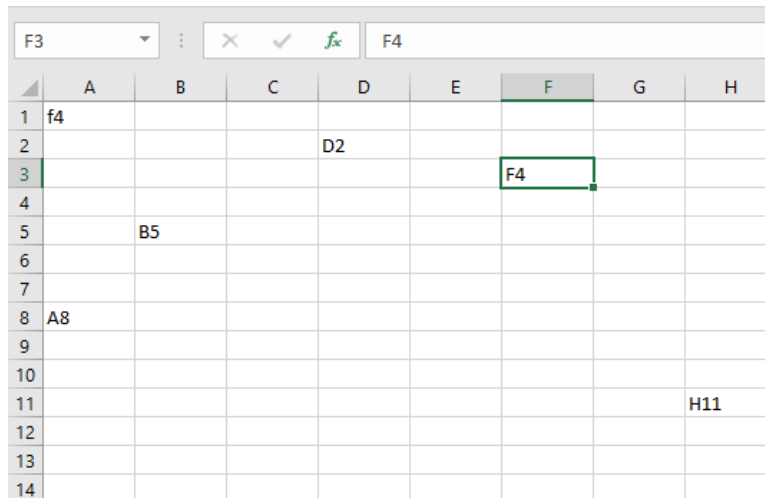
Check your progress:

- In MS Excel, rows are labelled with numbers and columns are labelled with letters. (True or False)
- What symbol is used to start a formula in MS Excel? (True or False)

7.2.2 Using Shortcuts

USING F5 KEY

When the F5 key is pressed, a 'Go To' dialog will appear on the screen. It will prompt you to enter the cell address you wish to go to, and then press enter, and the cursor will jump to that address.

An alternative to the F5 key is the CTRL+G shortcut key to move around the spreadsheet quickly.
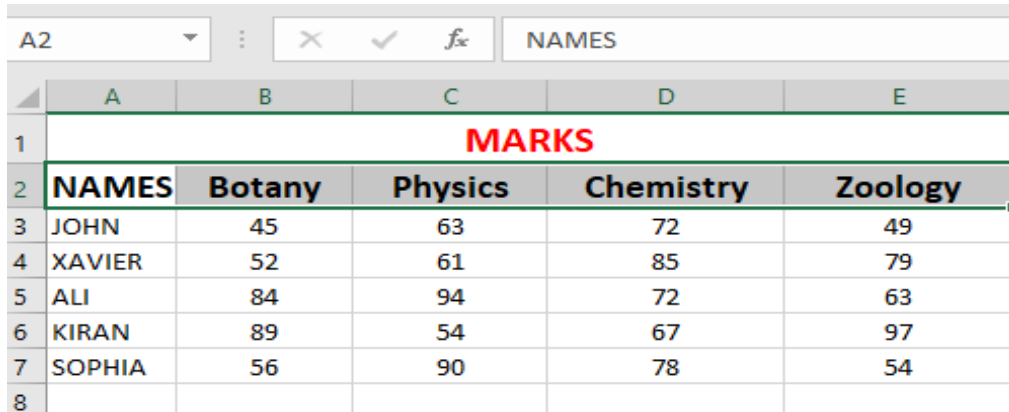
For Example: Type E2 in the dialog box and press enter. The cursor will move to the cell E2.
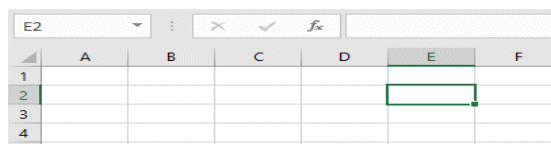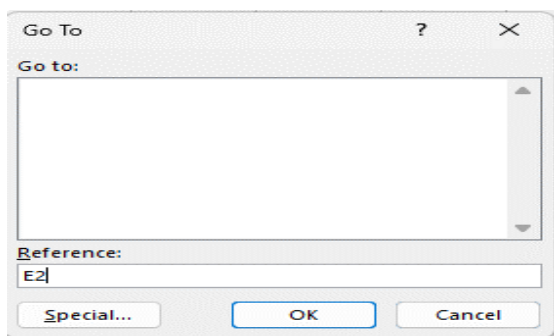
7.2.3 Entering Data in the Spreadsheet
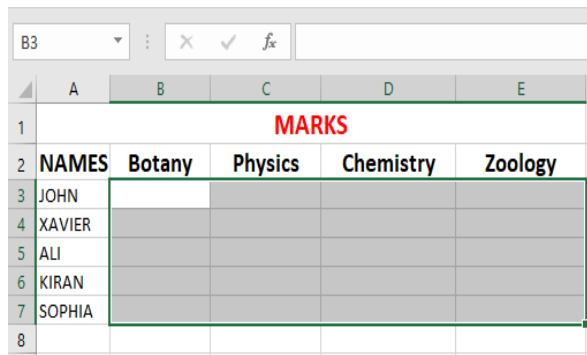
Consider the example 'MARKS' table in the spreadsheet. It contains the marks of 5 students in the given four subjects.

A2				fx	NAMES	
	A	B	C	D	E	
1			MARKS			
2	NAMES	Botany	Physics	Chemistry	Zoology	
3	JOHN	45	63	72	49	
4	XAVIER	52	61	85	79	
5	ALI	84	94	72	63	
6	KIRAN	89	54	67	97	
7	SOPHIA	56	90	78	54	
8						
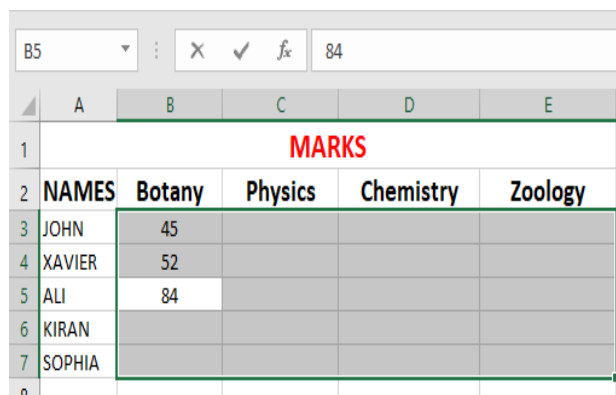
In order to enter data in a spreadsheet:

1. Open a new spreadsheet
2. Type all the given text. In order to move horizontally in the spreadsheet, use the 'tab' key; in order to move vertically, use the 'enter' key.
3. Now select the cells B2 to E7 using the mouse.
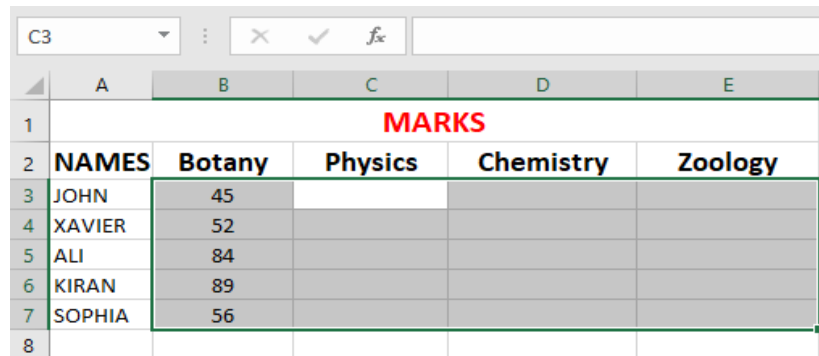
B3				fx	
	A	B	C	D	E
1			MARKS		
2	NAMES	Botany	Physics	Chemistry	Zoology
3	JOHN				
4	XAVIER				
5	ALI				
6	KIRAN				
7	SOPHIA				
8					

4. The selected area gets highlighted. Keeping the selected area highlighted, enter the values one after the other.

B5				fx	84	
	A	B	C	D	E	
1			MARKS			
2	NAMES	Botany	Physics	Chemistry	Zoology	
3	JOHN	45				
4	XAVIER	52				
5	ALI	84				
6	KIRAN					
7	SOPHIA					
8						

5. Use the enter key to move to the next cell. You will automatically move to the next columns if the selected area is still highlighted. Your spreadsheet will look something like this. Continue until you have entered all the values in your table.

7.2.4 Formatting Cells

Excel allows the formatting of text and data values. Consider the following value in the below picture. It is a 6-digit number. In order to make this number easily readable, add separators to it.

1. Go to the cell to be formatted and right-click on it. You will see a context menu (right-click menu). In the context menu, click on Format cells.
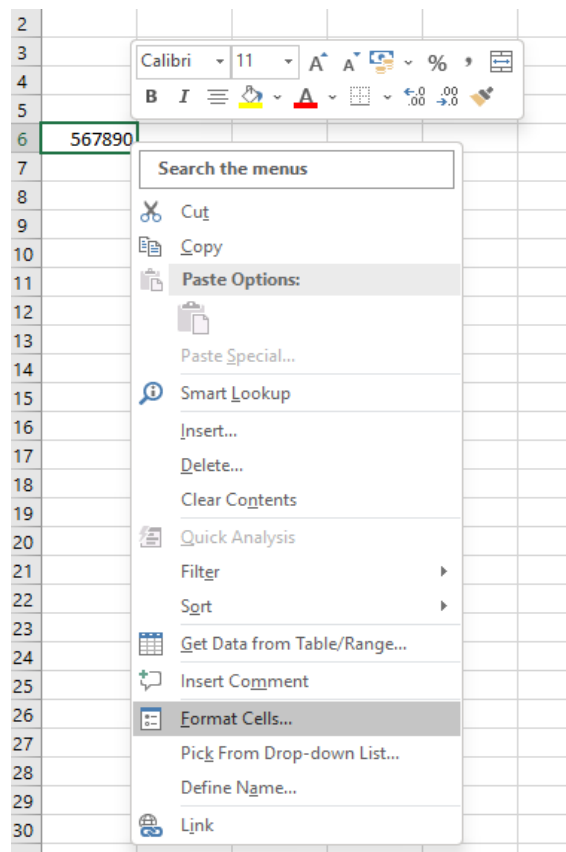
2. The Format Cells dialogue box will appear. It has many tabs like Number, Alignment, Font, etc. Click on the Number tab, and again on 'Number' in the Category box. You can type the number of decimal places you want your number to have. Like 2, 3, etc. Click on the 'Use 1000 separator' option and click OK.
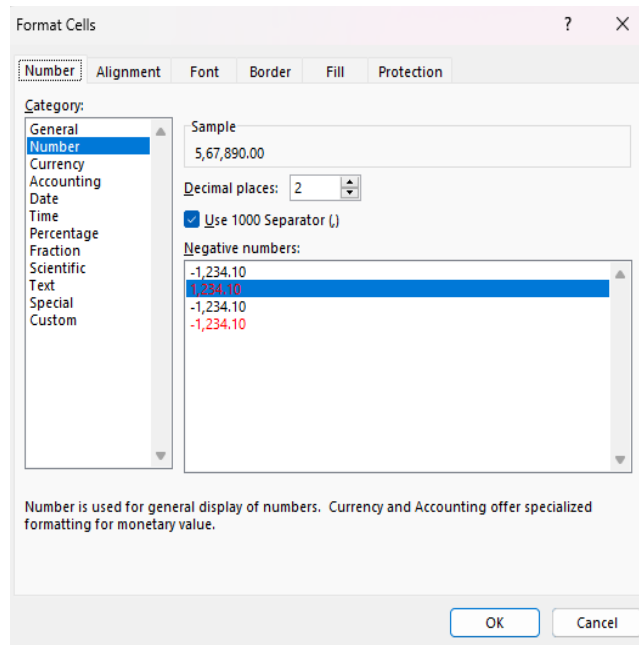
3. The data value now has separators and a decimal point.

4. To format the data value as a percentage, click on percentage under the Number tab in Category box. Enter the number of decimal places and click ok. The data value will be formatted as a percentage.

5. Alternative to the above method, the quick access toolbar (that appears when a cell is right-clicked) can be used to perform the formatting. The tool bar has a number of options like

increase decimal, decrease decimal, percentage, merge and centre the data, increase and decrease font, etc.
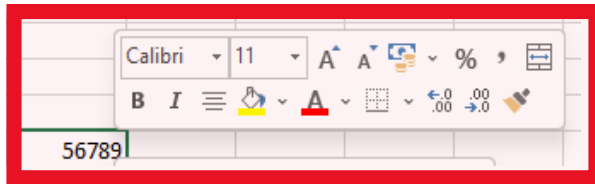
6. Data value is changed to percentage form using the toolbar.
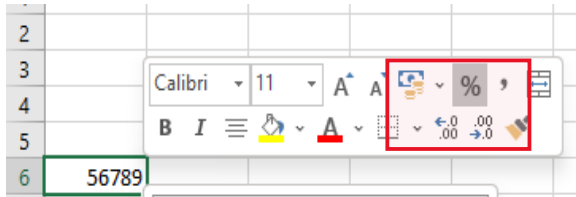
7. The data value is formatted as a percentage.
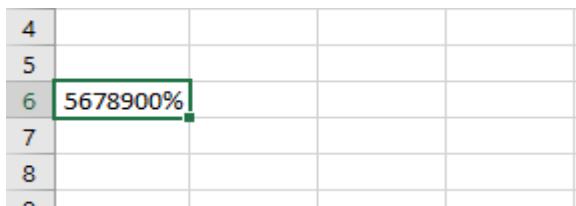
8. The data value is formatted as a decimal value.
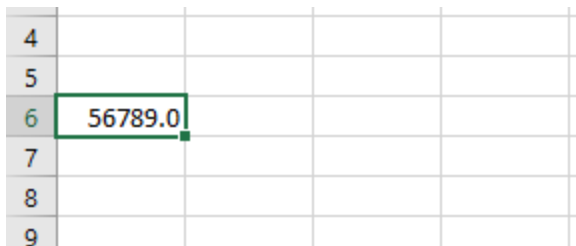
7.2.5 Using Formulas

Consider the following data in the spreadsheet. In order to find the total of marks for each student, do the following:

1. Go to the cell F3

2. Type the formula =SUM(B3:E3). This means the sum of data values from the cell B3 to E3). Alternatively, after entering **=SUM(** you can select the cells to be summed and it will be automatically shown after the opening bracket in the SUM formula.

3. Now press Enter

SUM	▼	⋮	✕	✓	*fx*	=SUM(B3:E3)		

◢	A	B	C	D	E	F
1			**MARKS**			
2	**NAMES**	**Botany**	**Physics**	**Chemistry**	**Zoology**	**TOTAL**
3	JOHN	45	63	72	49	E3)
4	XAVIER	52	61	85	79	
5	ALI	84	94	72	63	
6	KIRAN	89	54	67	97	
7	SOPHIA	56	90	78	54	

4. You can now see the total marks of the first student.

◢	A	B	C	D	E	F
1			**MARKS**			
2	**NAMES**	**Botany**	**Physics**	**Chemistry**	**Zoology**	**TOTAL**
3	JOHN	45	63	72	49	229
4	XAVIER	52	61	85	79	
5	ALI	84	94	72	63	
6	KIRAN	89	54	67	97	**Handle**
7	SOPHIA	56	90	78	54	

5. To find the sum total of all other students, just drag the handle up to the cell F7. And the sum total of all the other students will automatically appear.

◢	A	B	C	D	E	F
1			**MARKS**			
2	**NAMES**	**Botany**	**Physics**	**Chemistry**	**Zoology**	**TOTAL**
3	JOHN	45	63	72	49	229
4	XAVIER	52	61	85	79	277
5	ALI	84	94	72	63	313
6	KIRAN	89	54	67	97	307
7	SOPHIA	56	90	78	54	278

Automatic Calculation

Excel allows you to automatically recalculate the formulas when dependent data values are updated. Go to the Formula tab, and in it, go to Calculation Options and click Automatic.
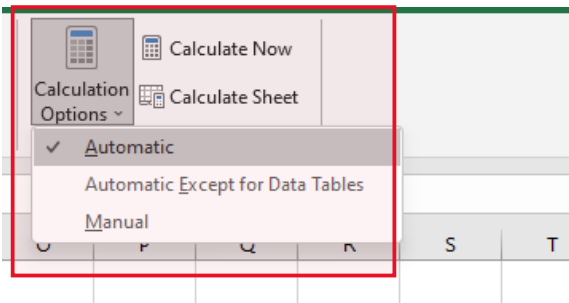
Consider the worksheet below. The highlighted cells in the second table show the updated marks of the first student and the updated total. The 'Total' has been updated automatically by Excel when Automatic option was selected.
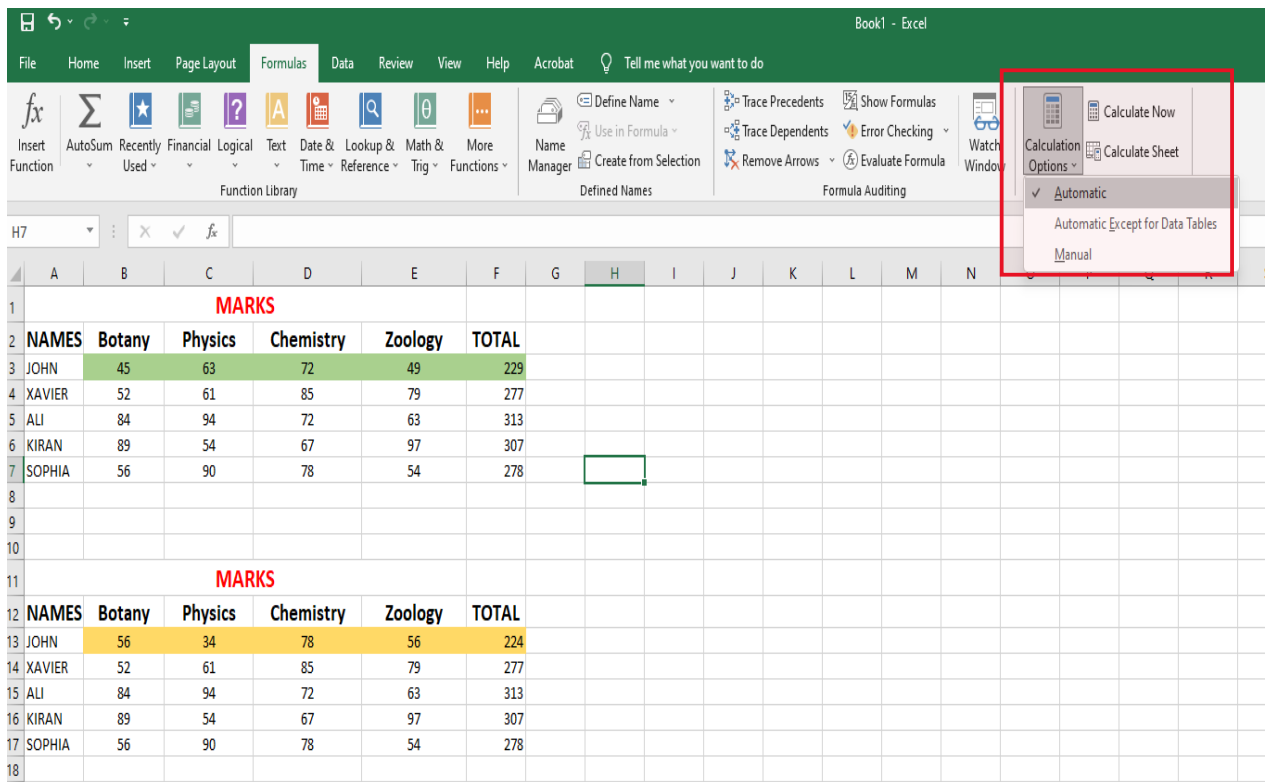
7.2.6 Some Basic Functions

7.2.6.1 AutoSum

The Auto Sum function allows you to calculate the sum of data values without having to type the formula. You can also use the other options under the Autosum menu, like Average, Minimum, Maximum, etc., without having to type the formulas.
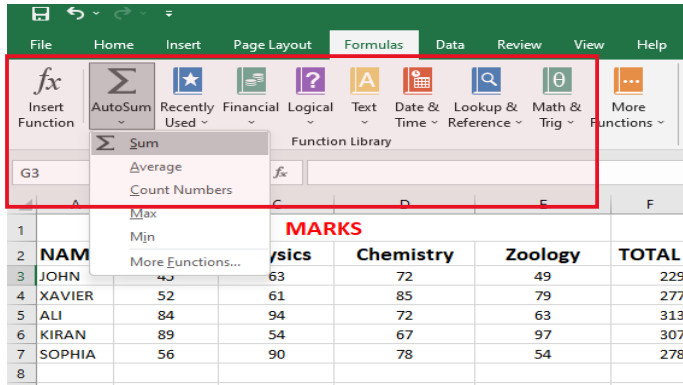
To calculate using the AutoSum Function

1. Click on the cell where you want your total to appear. Here in the below picture it is D3.
2. Go to the Formulas Tab
3. Clikck on AutoSum and then on Sum.
4. Now select all the data cells whose values are to be summed.
5. Press Enter

6. To calculate the sum of the remaining students, drag the handle of the D3 cell. All the remaining sums will also be calculated.

7.2.6.2 Show Formulas

The Show Formulas will show all the formulas that have been used in the current worksheet. Go to the Formulas tab, and under Formula Auditing, click on Show Formulas.

Date And Time Functions

The date and time can be displayed using the date and time function under the Formulas tab. Using this function, you can display the date of any year you wish to.
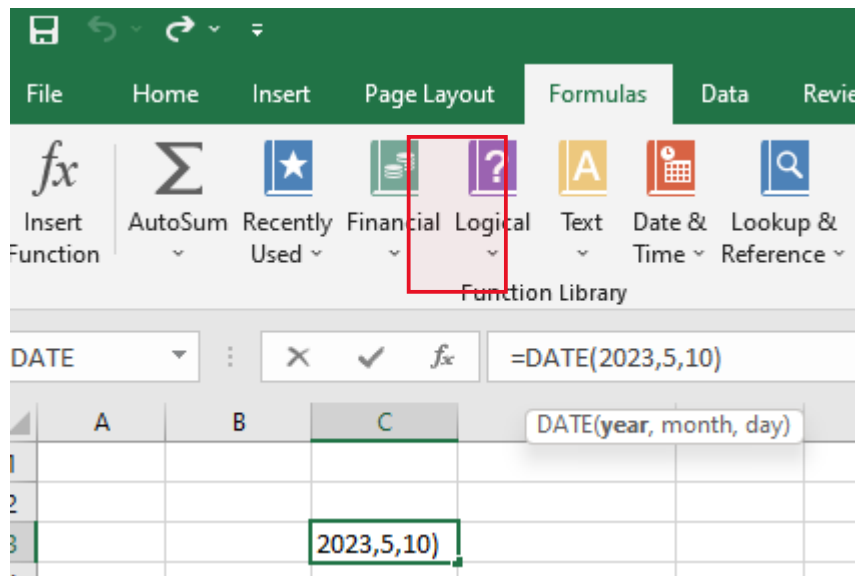
Alternatively, you can use =NOW() formula. It displays the current date and time. Another way to display the current date is by using the =TODAY() formula.

×	✓	fx	=NOW()

C	D	E	F
	16-05-2023 13:27		

▼	⋮	×	✓	fx	=TODAY()

B	C	D	E	F
16-05-2023				
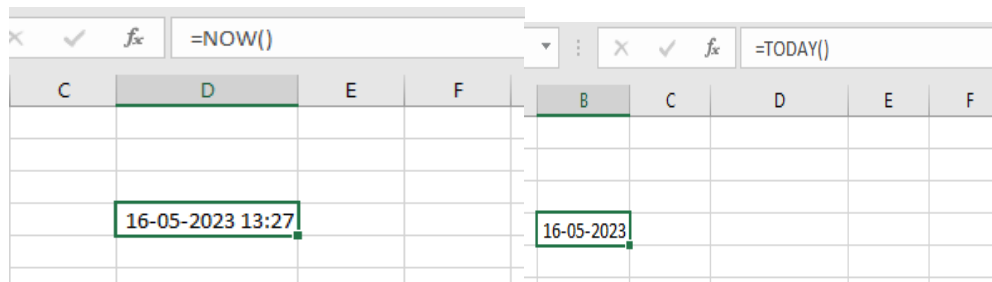
Series Function

Any series can be displayed using the cell handle. Consider the below example. If you wish to display the months of the calendar, then type January in the desired cell and drag the cell handle to display the remaining months.

A1	▼	⋮	×	✓	fx	JANUARY

	A	B	C	D
1	JANUARY			
2				
3				
4				
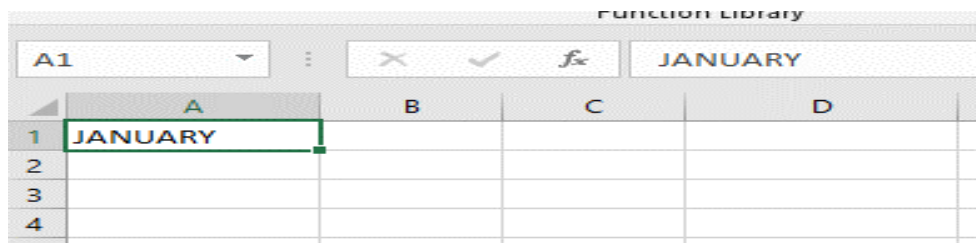
Your spreadsheet should now display all the months as shown below.

A1	▼	⋮	×	✓	fx	JANUARY

	A	B	C	D
1	JANUARY			
2	FEBRUARY			
3	MARCH			
4	APRIL			
5	MAY			
6	JUNE			
7	JULY			
8	AUGUST			
9	SEPTEMBER			
10	OCTOBER			
11	NOVEMBER			
12	DECEMBER			
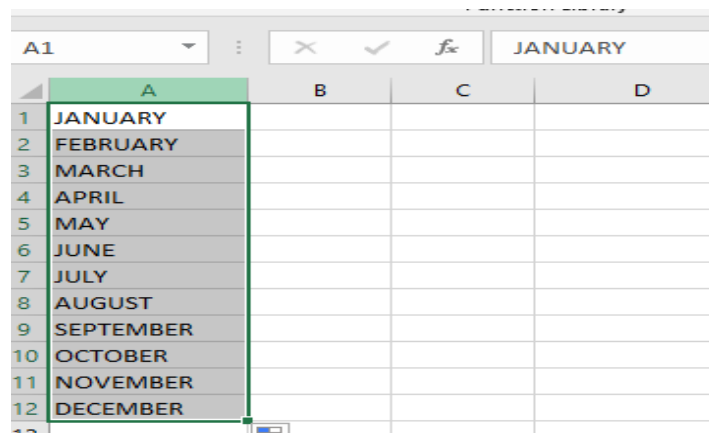
If you would like to display a number series, then do the following:

1. Type the first two numbers of the series you wish to display. For example, here 100 and 101.

A1	▼	⋮	×	✓	fx	100
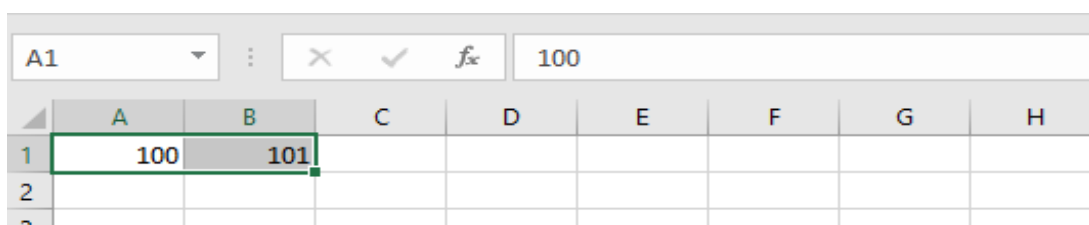
	A	B	C	D	E	F	G	H
1	100	101						
2								

2. Select the two cells containing 100 and 101. Now drag the cell handle to display the desired series.

3. Consider another example of displaying series like 100, 102, 104 and so on…

4. Type the first two numbers of the series and drag the cell handle. The desired series gets displayed.

7.2.7 Creating Charts

Microsoft Excel allows you to represent data in graphical form. Chats make the data interesting, easily readable, and presentable.

In order to create a chart in Excel

1. Enter the given data and select the cells that you want to be represented as a chart.
2. Now go to the insert tab, and from the chart group, choose the type of type you wish to display.
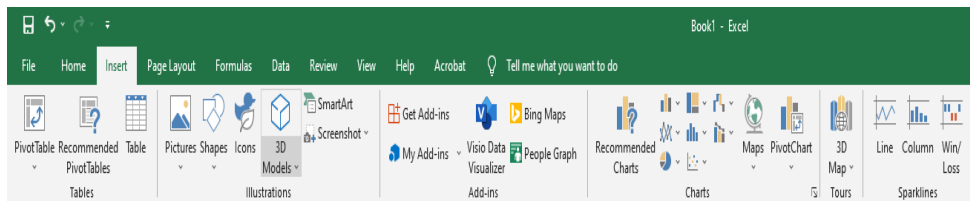
3. The charts group has a number of different chart types like bar charts, pie charts, line graphs, column charts, etc.
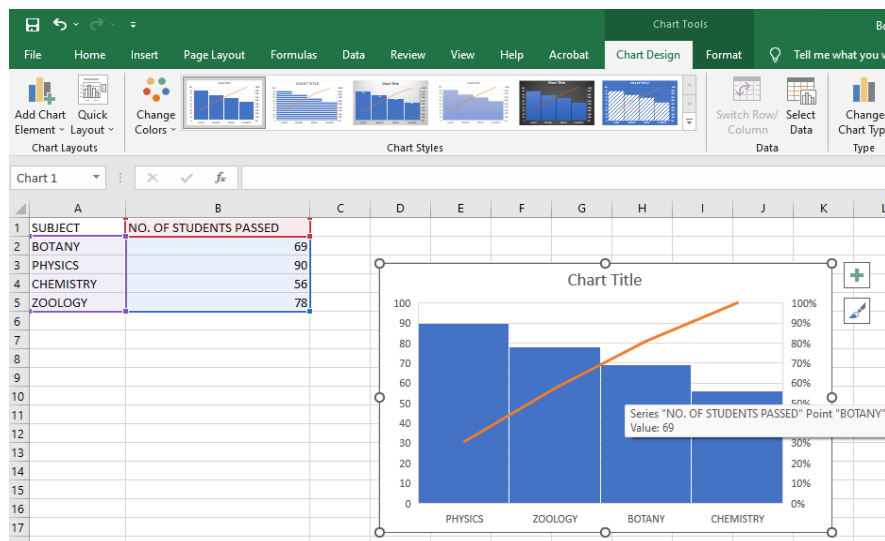
4. Choose the desired chart type. Your data will be represented in the selected chart style.

5. You can also format your chart. Click on the chart to be formatted, and you will see that a new tab called 'Chart Design' appears over the ribbon.

6. Click on the Chart Design tab and choose from the different chart styles.

7. You can also move and resize your chart by dragging the chart handles.

7.2.8 Let Us Sum Up

This Unit provides a foundational understanding of Microsoft Excel, a powerful spreadsheet application used for data organisation, analysis, and visualisation.

Learners begin by exploring the interface, including key components such as the ribbon, worksheet tabs, and the status bar. They gain hands-on experience in creating, saving, and managing spreadsheets while learning to input and format data effectively. The Unit emphasises the use of basic formulas and functions like SUM, AVERAGE, MIN, and MAX, which help perform simple calculations. It also covers the essential concepts of cell referencing and data manipulation through sorting, filtering, and organising rows and columns.

To enhance data presentation skills, learners are guided on creating and formatting basic charts and graphs, making their spreadsheets visually appealing. Additionally, the Unit introduces data validation techniques to ensure input accuracy and concludes with a focus on preparing spreadsheets for printing with proper page layout settings.

7.3 Learning Outcomes

Now that you have completed the Unit, you can:
- Present an overview of Excel's interface and its various components, including the ribbon, workbook, worksheet, and cells.
- Create, save, and open Excel workbooks
- Navigate and understand worksheets and workbooks.
- Enter and edit data in cells.
- Use formulas and functions
- Create and customise basic charts and graphs to visualise data.

7.4 Glossary

- **Cell:** The basic unit in an Excel worksheet where you enter data, identified by the intersection of a row and a column (e.g., A1).
- **Workbook:** An Excel file that contains one or more worksheets. It is the main file format used in Excel.
- **Worksheet:** A single spreadsheet within a workbook, consisting of rows and columns.
- **Ribbon:** The toolbar at the top of the Excel interface that organises commands into tabs (e.g., Home, Insert, Page Layout).
- **Formula:** A mathematical expression entered into a cell to perform calculations
- **Function:** A predefined formula in Excel that simplifies complex calculations
- **Cell Reference:** The way a cell is identified in Excel, using its column letter and row number (e.g., B3). It can be relative, absolute, or mixed.
- **Range:** A selection of two or more cells, identified by the top-left and bottom-right cell references (e.g., A1).

7.5 Sample Questions

7.5.1 Objective Questions

1. The intersection of a row and a column in an Excel worksheet is called a _____.

   (*Answer: Cell*)

2. The toolbar at the top of the Excel interface, which organises commands into tabs, is known as the _____. *(Answer: Ribbon)*

3. A _____ is a predefined formula in Excel that simplifies calculations. *(Answer: Function)*

4. To arrange data in ascending or descending order, you use the _____ feature. (*Answer: Sort)*

5. A selection of multiple cells in a worksheet, defined by the top-left and bottom-right cell references, is called a _____. *(Answer: Range)*

6. What is the main purpose of Microsoft Excel?

    a) Writing documents

    b) **Creating spreadsheets for data analysis and management**

    c) Designing presentations

    d) Editing images

7. Which of the following is a valid cell reference in Excel?

    a) **A1**

    b) Cell 1A

    c) 1A

    d) Box A1

8. Which tab on the Ribbon is used to insert charts and images into a worksheet?

    a) Home

    b) **Insert**

    c) View

    d) Data

9. What does the =SUM(A1:A10) function do?

    a) Calculates the average of values in cells A1 to A10

    b) Counts the number of cells in A1 to A10

    c) Displays the maximum value in cells A1 to A10

    d) **Adds the values in cells A1 to A10**

10. Microsoft Excel allows you to represent data in graphical form. (**True** / False).

7.5.2 Short Answer Questions

1. Explain the difference between a workbook and a worksheet in MS Excel. Give examples to support your response.

2. What are formulas and functions in Excel? Write an example of each and explain their purpose.

3. Describe the steps to create a basic chart in Excel. Mention the types of charts available and when to use them.

7.5.3 Long Answer Questions

1. What are the different types of data that can be entered into an Excel worksheet? Explain the difference between text, numbers, and dates. How can you format each type of data for better readability and analysis?

2. Explain the concept of Excel's 'AutoFill' feature. How does it work for filling data in rows and columns? Discuss its use in scenarios such as filling in series, copying formulas, and applying formatting quickly.

7.6 Suggested Learning Resources

Harvey, Greg. *Excel 2019 All-in-One For Dummies.* For Dummies (A Wiley Brand), 2018.

Wild, Johannes. *Excel 101: A Beginner's & Intermediate's Guide for Mastering the Quintessence of Microsoft Excel (2010-2019 & 365) in No Time!*. 3Dtech, 2021.

Unit-8: MS Excel-II

Structure

8.0 Introduction
8.1 Objectives
8.2 MS Excel-II
       8.2.1 Array Formulas
       8.2.2 Logical Functions
       8.2.3 Lookup and Reference Functions
       8.2.4 Text Functions
       8.2.5 Data Analysis
       8.2.6 Data Visualisation
       8.2.7 Let Us Sum Up
8.3 Learning Outcomes
8.4 Glossary
8.5 Sample Questions
8.6 Suggested Learning Resources

8.0 Introduction

In the previous Unit, we explored the foundational features of Microsoft Excel, such as creating and formatting spreadsheets, using basic formulas, and organising data efficiently. Building on your foundational knowledge of Microsoft Excel, this Unit will explore advanced methods and technologies that will enable you to fully use this sophisticated program.

In this Unit, *MS Excel II*, we will delve deeper into the powerful capabilities of Excel that transform it from a simple data management tool into a sophisticated analytical powerhouse. This Unit is designed to equip you with advanced features and functions that are crucial for data analysis, automation, and decision-making. You will learn how to work with advanced formulas and functions, including logical, statistical, and lookup functions. Additionally, we will explore tools like PivotTables and PivotCharts for dynamic data analysis and visualisation, conditional formatting for enhanced insights, and data validation techniques to maintain accuracy and consistency.

8.1 Objectives

By the end of this Unit, you will be able to:

- Master advanced Excel functions
- Analyze data effectively
- Develop proficiency in data visualization
- Develop efficiency and workflow optimization skills

8.2 MS Excel-II

8.2.1 Array Formulas

In the context of Microsoft Excel, an array refers to a collection of data values that are grouped together in a single structure. These values can be text, numbers, or a mix of both. Arrays are collections of cells treated as a single unit. They can be one-dimensional, consisting of either a row or a column of cells, or two-dimensional, encompassing multiple rows and columns. This classification allows for various calculations and manipulations on multiple values simultaneously, leading to more efficient and powerful formulas.

Microsoft defines an array formula as "a formula that can perform multiple calculations on one or more items in an array." Array formulas enable users to do intricate computations over several cells, facilitating the mass processing of data sets with a single formula. Array formulas function on cell ranges rather than individual cells, providing enhanced efficiency and faster calculations.

Basic Structure of Array Formulas

Array formulas in Excel are denoted by curly braces {}, indicating to Excel that the formula should be processed as an array. To input an array formula, use Ctrl + Shift + Enter after entering the formula, instructing Excel to compute the full range simultaneously. This is commonly known as a "CSE" (Ctrl + Shift + Enter) formula.

Examples:

Scenario 1:

Suppose you have three columns denoting marks in three subjects—*English* (B), *Science* (B), *and Maths (D).* You want to find the overall average of a class of 10 students.

Traditional approach:

You would create a new column E and first calculate the average of each row using the formula **=(B2+C2+D2)/3.** Then you would use the AVERAGE function **=AVERAGE(E2:E11)** to find the total average of column E.

Array Formula Approach:

Instead of going the traditional way, you can achieve this result with just one array formula: AVERAGE(B2:D11). Select the cell where you want your average to appear, type in the formula, and press Ctrl+Shift+Enter after writing the formula.

How it Works:

- This formula will calculate the average of each row in the range B2:D11 and create an array of averages.
- The **AVERAGE** function then averages the values in the array to give you the overall average.

Find the illustration in the figure below.
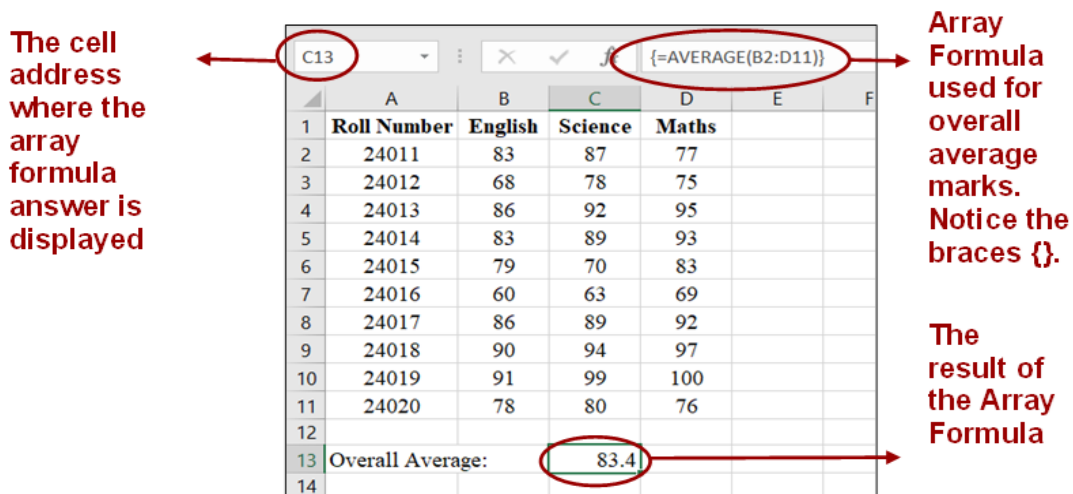
Fig: 8.1 Array Formula Scenario 1

Scenario 2:

Let us say you have a list of sales figures in column A and corresponding commission rates in column B. You want to calculate the total commission.

Traditional Approach:

You would create a new column (C) to calculate the commission for each row using a formula like **=A2B2.** Then, you would use the **SUM** function to add up the values in column C.

Array Formula Approach:

You can achieve the same result with a single array formula: Select a cell where you want the total commission to appear. Enter the following formula and press Ctrl+Shift+Enter: **=SUM(A2:A11B2:B11)**

How it Works:

- The formula multiplies each value in range A2:A11 by the corresponding value in range B2:B11, creating an array of products.

- The **SUM** function then adds up all the values in this array, giving you the total commission.

- Now that you have an understanding of how array formulas work, you must already be appreciating their advantages in your mind. Let us look at all the **advantages** that array formulas offer us.

- **Data Analysis Efficiency**: With array formulas, you may execute many computations on a range of cells at the same time. This is speedier and more efficient, especially when dealing with huge data sets.

- **Eliminates the Need for Helper Columns**: When using array formulas, you may generally avoid constructing additional columns for intermediate computations. This keeps your worksheet clean and organised.

- **Conditional Calculations**: Array formulas allow you to do calculations depending on conditions across several cells. For example, you may compute the total of values using criterion.

- **Dynamic Updates:** Array formulas are updated as the underlying data changes. This guarantees that your findings are consistently accurate without the need to re-enter the formula.

- **Powerful Summarisation Functions**: They enable complicated aggregations (e.g., SUM, AVERAGE, MIN, MAX) utilising many criteria without the need for extra functions such as SUMIFS or COUNTIFS.

- **Better Performance**: Because array formulas conduct computations in one step, they can be more efficient than employing numerous formulas in distinct cells.

- **Error Reduction**: By reducing repetitive formulas, array formulas lessen the risk of mistakes because you only need to test one formula rather than many distinct ones.

8.2.2 Logical Functions

Logical functions execute logical processes and facilitate decision-making based on defined circumstances. These functions return either TRUE or FALSE values, which can be used to control the flow of calculations and formatting. Here are some popular logical functions.

1. IF Function

- **Syntax**: **=IF(condition, value_if_true, value_if_false)**

- **Usage**: The IF function evaluates a specified condition, returning one value if the condition is true and a different value if it is false. It is highly beneficial for decision-making processes, such as categorising data based on criteria or calculating bonuses based on performance.

- **Example**: **=IF(B2 > 40, "Pass", "Fail")** – This checks if a value in cell B2 is greater than 40. If true, it returns "Pass"; otherwise, it returns "Fail."

The example is illustrated in the following figure.

Fig: 8.2 Example of IF Function (for one row)

Fig. 8.3: Extending the IF function for all the rows

147

2. AND Function

- **Syntax**: **=AND(condition1, condition2, …)**
- **Usage**: AND checks more than one condition and only returns TRUE if all of them are true. If any of them are false, it returns FALSE. It is commonly combined with IF for advanced conditional checks.
- **Example**: **=IF(AND(A2 >= 40, B2 >= 40), "Eligible", "Not Eligible")** – Here, a person qualifies if both A2 and B2 are 40 or above.

3. OR Function

- **Syntax**: **=OR(condition1, condition2, …)**
- **Usage**: OR checks more than one condition and returns TRUE if at least one of them is true. If not, it returns FALSE. It is also often used with IF for flexible decision-making.
- **Example**: **=IF(OR(A2 >= 40, B2 >= 40), "Eligible", "Not Eligible")** – This formula returns "Eligible" if either A2 or B2 is 40 or above.

4. NOT Function

- **Syntax**: **=NOT(condition)**
- **Usage**: NOT negates the result of a logical condition. If a condition is true, NOT yields FALSE; if the condition is false, NOT yields TRUE. It is useful when you want the opposite of a condition.
- **Example**: **=IF(NOT(A2 > 40), "Below Threshold", "Above Threshold")** – This will return "Below Threshold" if A2 is not greater than 50.

5. IFERROR Function

- **Syntax**: **=IFERROR(value, value_if_error)**
- **Usage**: IFERROR checks if a formula results in an error and, if so, returns a specified value; otherwise, it returns the result of the formula. This is helpful in handling errors gracefully without breaking your formulas.
- **Example**: **=IFERROR(A2/B2, "Error")** – If B2 is zero (causing a division error), the formula will return "Error" instead of showing an error message.

6. IFS Function

- **Syntax**: **=IFS(condition1, result1, condition2, result2, …)**
- **Usage**: IFS simplifies multiple nested IF statements by checking each condition in order and returning the corresponding result for the first true condition.

- **Example**: **=IFS(B2 >= 90, "A", B2 >= 80, "B", BA2 >= 70, "C", TRUE, "F")** – This assigns letter grades based on the score in BA2.

Fig. 8.4: Example of IFS Function

7. SWITCH Function

- **Syntax**: **=SWITCH(expression, value1, result1, value2, result2, …, [default])**
- **Usage**: SWITCH evaluates an expression and compares it to a list of values, returning the corresponding result for the first match. It is an alternative to nested IFs for specific conditions.
- **Example**: **=SWITCH(A2, "M", "Male", "F", "Female", "Unknown")** – This returns "Male" for "M," "Female" for "F," and "Unknown" for any other value in A2.

  Now let us see the practical applications and advantages of logical functions.

 Applications:
- **Conditional formatting:** Applying certain formatting depending on logical criteria.
- **Data Validation**: Limit input values to a given range or group of values in order for data validation.
- **Decision Making:** Create formulae based on several parameters that guide decisions.
- **Filtering Data:** Filter data according to logical criteria:

Advantages:
- **Decision-Making:** Logical functions enable Excel to execute data-driven judgements based on specified criteria, which is essential in data analysis, forecasting, and reporting.
- **Error Management:** Excel's logical capabilities enable the program to make judgements that are driven by data and based on criteria, which is an essential capability for data analysis, forecasting, and reporting.

- **Automation:** Automating condition-based computations and logical functions diminishes the necessity for human verifications and modifications.
- **Data Categorisation:** Logical functions facilitate the categorisation of data, hence augmenting insights and data organisation. Examples of such functions are pass/fail and different grades.

Check your progress:
1. The _____ function in MS Excel is used to negate the result of a logical condition.
2. The IF function in Excel can be used for logical comparisons that return different results based on conditions. (True or False)

8.2.3 Lookup and Reference Functions

Excel's lookup and reference capabilities are crucial for finding and obtaining data in huge datasets, enabling users to efficiently manage and examine data across worksheets. These features are especially helpful for activities like reducing complicated data structures, producing dynamic reports and searching for specific information. An outline of several frequently used lookup and reference functions is provided below:

1. VLOOKUP (Vertical Lookup)
- **Syntax**:=VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])
- **Usage**: VLOOKUP looks for a certain value in the first column of a table and returns a value from another column in the same row. This is handy for identifying connected data points, like retrieving a student's marks based on their roll number.
- **Example**: **=VLOOKUP(C2, E2:G10, 3, FALSE**) – This searches for the value in C2 within the first column of the range E2 and returns the corresponding value from the third column of that range.

2. HLOOKUP (Horizontal Lookup)
- **Syntax**: =HLOOKUP(lookup_value, table_array, row_index_num, [range_lookup])
- **Usage**: Similar to VLOOKUP, HLOOKUP searches for a value in the first row of a range and returns a value from a specified row within the same column. This function is useful for datasets organised horizontally.

- **Example**: **=HLOOKUP(A2, B1:H4, 3, TRUE)** – This searches for A2 in the first row of B1 and returns the corresponding value from the third row.

3. INDEX

- **Syntax**: **=INDEX(array, row_num, [column_num])**
- **Usage**: INDEX retrieves the value of a cell within a defined range, using row and column numbers. It is particularly useful when combined with MATCH for flexible lookups.
- **Example**: **=INDEX(B2:F10, 5, 3)** – This returns the value in the fifth row and third column of the B2 range.

4. MATCH

- **Syntax**: **=MATCH(lookup_value, lookup_array, [match_type])**
- **Usage**: MATCH finds the relative position of a specified value within a range, which can be used with INDEX for more dynamic lookups. It is ideal for finding the row or column number where a specific value is located.
- **Example**: **=MATCH("Subject A", A2:A10, 0**) – This finds the position of "Subject A" in the range A2.

5. INDEX-MATCH Combination

- **Usage**: By combining INDEX and MATCH, you can create powerful lookups that are more flexible and faster than VLOOKUP or HLOOKUP, especially when looking up values from multiple columns or rows.
- **Example**: **=INDEX(B2:B10, MATCH("Subjectt A", A2:A10, 0))** – This looks up "Subject A" in A2 and returns the corresponding value from the B2 range.

6. LOOKUP

- **Syntax**: **=LOOKUP(lookup_value, lookup_vector, [result_vector])**
- **Usage**: LOOKUP finds a value in a one-dimensional range (vector) and returns a corresponding value from another vector. It is simpler than VLOOKUP or HLOOKUP but limited in functionality.
- **Example**: **=LOOKUP(A2, B2:B10, C2:C10**) – This searches for A2 in B2 and returns the corresponding value from C2.

7. CHOOSE

- **Syntax**: **=CHOOSE(index_num, value1, [value2], …)**
- **Usage**: CHOOSE selects a value from a list using a given index. It is handy for choosing from a small number of possibilities.

- **Example**: **=CHOOSE(2, "Apple", "Banana", "Cherry")** – This returns "Banana" because it is the second item in the list. Rows down and one column over from A1, covering three rows and two columns.

8. TRANSPOSE

- **Syntax**: **=TRANSPOSE(array)**
- **Usage**: TRANSPOSE changes the orientation of a range, turning rows into columns and vice versa. It is useful when rearranging data to fit a different structure.
- **Example**: **=TRANSPOSE(A1:C3)** – This changes a 3x3 matrix to a 3x3 matrix with rows and columns swapped.

Advantages of Utilising Lookup and Reference Functions

- **Data Management:** These features facilitate the identification and retrieval of data across extensive tables and numerous sheets.
- **Dynamic Reports**: By referencing cells subject to change, lookup functions facilitate the creation of dynamic reports that dynamically refresh with new data.
- **Error Reduction**: They diminish manual data entry, hence minimising inaccuracies and enhancing the precision of data analysis.
- **Time Efficiency**: Lookup functions rapidly extract information from extensive data sources, saving time in data analysis and reporting.

8.2.4 Text Functions

Text functions in Excel are useful for organising and manipulating text strings. These routines can help you clean, prepare, and analyse textual data effectively, making them useful for projects with big datasets including both text and numerical information. Here is an overview of some text functions.

CONCATENATE Function:

- Usage: CONCATENATE joins multiple text strings into one.
- Syntax: **CONCATENATE(text1, [text2], ...)**
- Example 1: **=CONCATENATE("Maulana ", "Azad ", "National ", "Urdu ", "University")** combines the text strings "Maulana ", "Azad ", "National ", "Urdu ", and "University" to produce "Maulana Azad National Urdu University". Notice that the first four strings contain a space after each word; if you remove the space here, the result will be a

continuous string of five words without space anywhere in between (Fig 8.5).
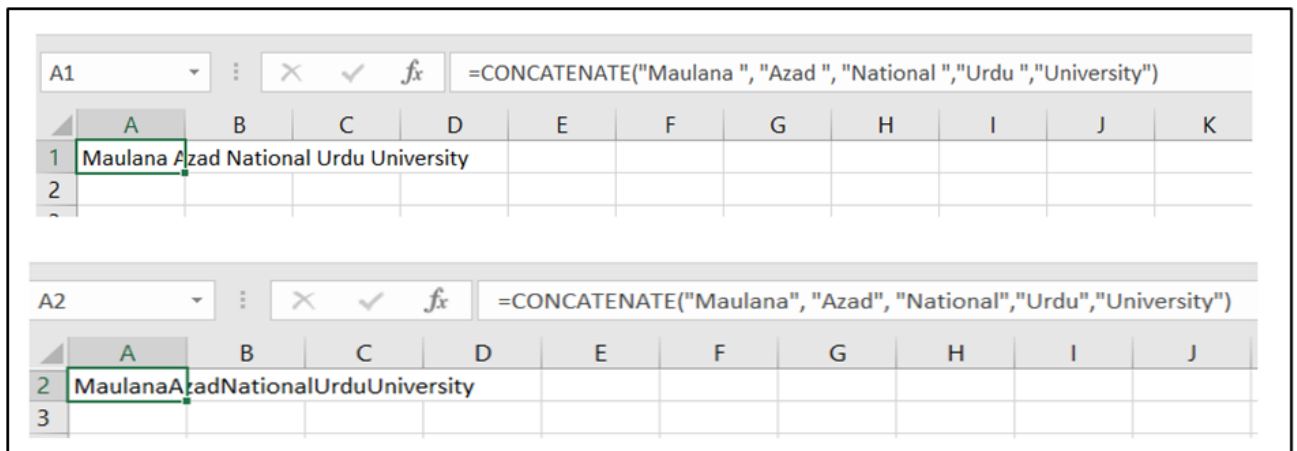
Fig 8.5: Example of Concatenate Function

Another way to concatenate strings with space between them is shown in example 2.

Example 2: =CONCATENATE(A2, " ", B2) – This combines the values in cells A2 and B2 with a space between them.

LEFT, RIGHT, and MID Functions:

- Usage: LEFT, RIGHT, and MID extract specific parts of a text string. LEFT and RIGHT pull text from the beginning or end, while MID extracts text from the middle.
- Syntax
    - LEFT Syntax: **LEFT(text, [num_chars])**
    - RIGHT Syntax: **RIGHT(text, [num_chars])**
    - MID Syntax: **MID(text, start_num, num_chars)**
- Example:
    - **=LEFT(A2, 4)** – This returns the first four characters from cell A2.
    - **=RIGHT(A2, 3)** – This returns the last three characters from A2.
    - **=MID(A2, 3, 4)** – This returns four characters from A2, starting from the third character.

This is illustrated in the following figure.
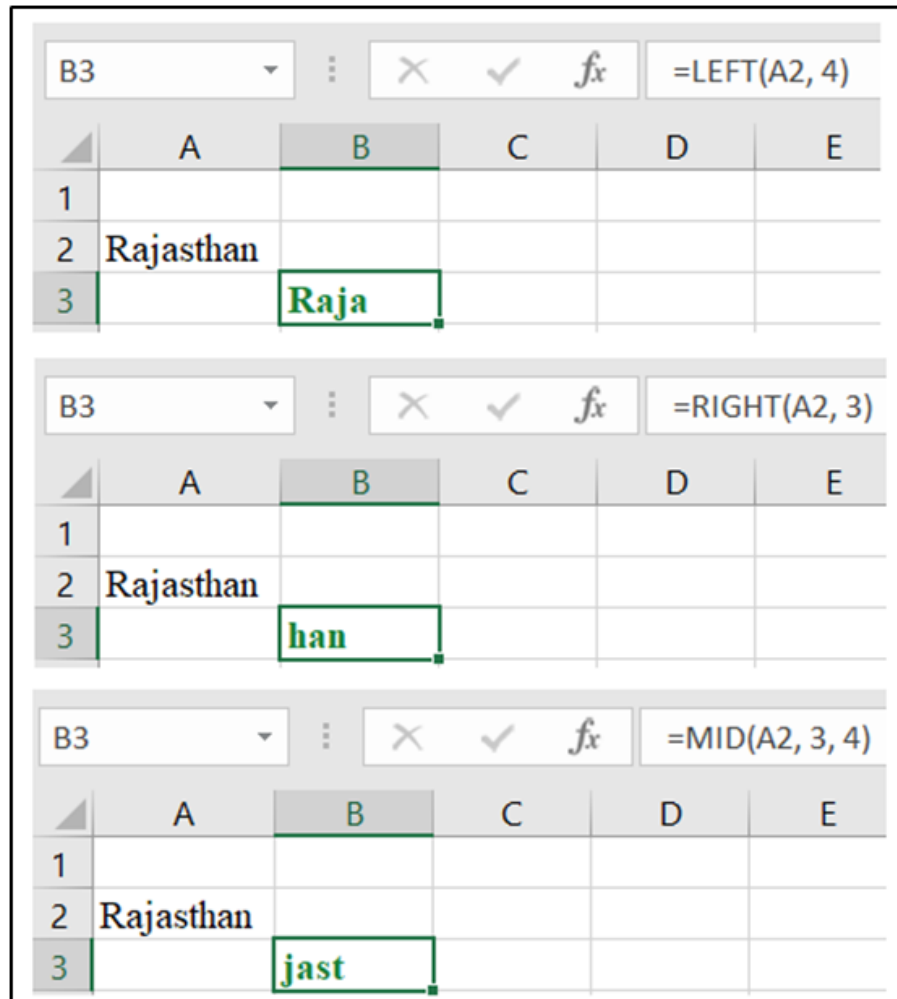
Fig. 8.6: Example showing Left, Right and Mid functions

UPPER, LOWER, and PROPER Functions

Usage: These functions alter the text's case. UPPER transforms text to all uppercase, LOWER converts text to all lowercase, and PROPER capitalises the initial letter of each word.

- **Syntax:**
    - =UPPER(text)
    - =LOWER(text)
    - =PROPER(text)
- **Examples:**
    - =UPPER(A2) – Converts the text in A2 to all uppercase.
    - =LOWER(A2) – Converts text in A2 to all lowercase.
    - =PROPER(A2) – Capitalises the first letter of each word in A2.

Fig 8.7: Example showing UPPER and PROPER functions

TEXT Function

- **Usage:** TEXT converts a number into text based on a defined format. It is useful for creating custom number displays or combining numbers with text.
- **Syntax: =TEXT(value, format_text)**
- **Example 1: =TEXT(A2, "0.00%")** – This converts a number in A2 to a percentage format with two decimal places.
- **Example 2: =TEXT(A1, "dd/mm/yyyy")** formats the value in cell A1 as a date in the "dd/mm/yyyy" format.

TRIM Function

- **Usage:**TRIM eliminates excess spaces from a text string, retaining just single spaces between words. This is very useful for cleaning up data imported from other sources.
- **Syntax**: **=TRIM(text)**
- **Example**: **=TRIM(A2)** – This removes all extra spaces in A2, leaving only single spaces between words.

Advantages of Using Text Functions

- **Data Cleaning and Standardisation**: Text functions make it easy to format, trim, and adjust text data to ensure consistency.
- **Automation of Text Processing**: Text functions simplify tasks such as reformatting data, adding prefixes or suffixes, or combining multiple text fields.
- **Improved Readability and Presentation**: Functions like PROPER, and TEXT help display data in a user-friendly format, making reports and analyses easier to read.
- **Enhanced Data Analysis**: Text functions enable you to extract important insights by means of text data analysis and manipulation, therefore facilitating the trend discovery and interpretation in datasets.

8.2.5 Data Analysis

The process of translating raw data into useful insights via the use of a variety of techniques and tools is referred to as data analysis. At its core, data analysis is the study, purification, manipulation, and modelling of data to find usable information, draw conclusions, and support decision-making. Think of it as turning raw numbers into insightful narratives. Here are the key steps involved:

1. **Data Collection:** Collecting relevant information from many sources.
2. **Data Cleaning:** Eliminating or rectifying any inaccuracies or discrepancies in the data.
3. **Data Transformation:** Converting data into a format suitable for analysis.
4. **Data Analysis:** Applying statistical methods, algorithms, or models to uncover patterns, trends, and relationships.
5. **Data Interpretation:** Drawing meaningful conclusions from the analysed data.
6. **Data Visualisation:** Creating charts, graphs, and other visual representations to communicate findings clearly.

This process enables users to make decisions based on accurate information. Excel offers a wide variety of data analysis capabilities, ranging from fundamental tools such as sorting and filtering to more complex tools such as statistical analysis, graphical representations, and modelling. Data analysis is applicable across several domains, including business, healthcare, and social sciences, to facilitate informed decision-making and promote advancement. The following is a sketch of some of the most important data analysis functions that Excel offers:

1. Sorting and Filtering

- **Sorting:** Sorting allows you to organise data depending on one or more columns, either in ascending or descending sequence. This feature is useful for organising data, such as listing products by price or sorting employees by date of joining.
- **Filtering**: Filters allow you to view only the rows that meet specific criteria. You can apply filters to text, numbers, dates, and even use custom filters. It is especially useful for quickly narrowing down data within large datasets.
- **Example**: Applying a filter to show only sales transactions above a certain amount or sorting a student list alphabetically.

Let us take the same list of English classics as we did in the previous section. Now, notice the sorting of the list from A to Z.
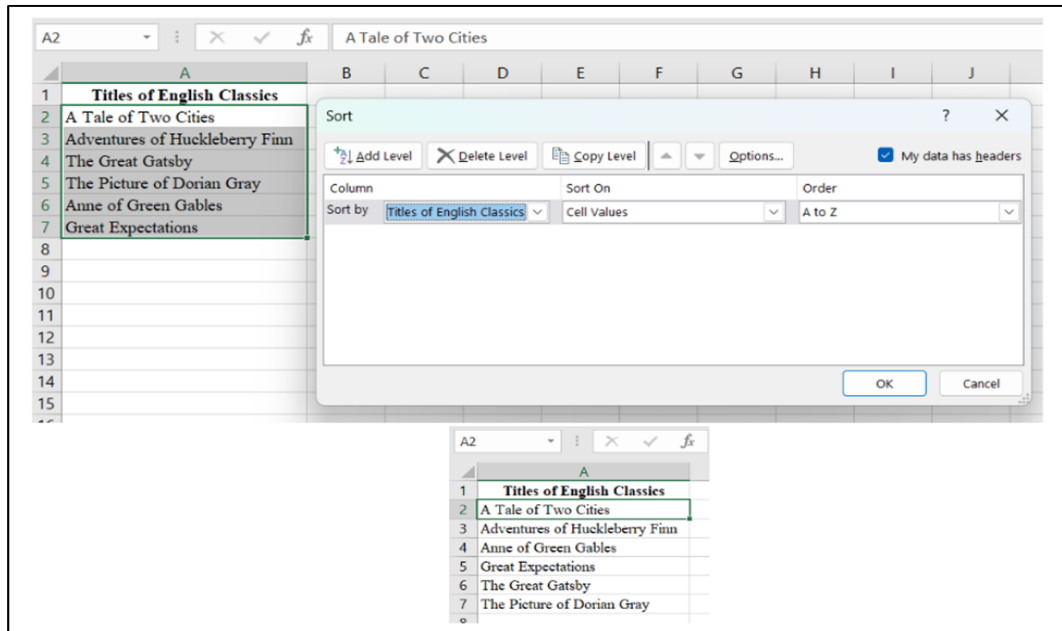
Fig. 8.8: Example showing the Sort Function

2. Conditional Formatting

- **Usage**: Conditional formatting highlights data based on certain criteria, making it simpler to see patterns, outliers, and crucial numbers. You can use built-in rules or create custom rules based on formulas.

- **Example**: Highlighting cells that exceed a certain value, marking duplicate entries, or using colour scales to show performance levels across data ranges.

- **Popular Options**: Colour Scales, Data Bars, and Icon Sets that visually represent the values in cells.

3. PivotTables and PivotCharts

PivotTables: In Excel, a pivot table is a useful tool for data analysis that lets you rapidly group and reorganise data without changing the underlying dataset, therefore summarising, organising, and analysing vast amounts. Perfect for producing insights and reporting, pivot tables let users see and analyse data from several angles.

Creating a PivotTable:

- Select your data range.

- Go to the Insert tab and click on PivotTable.

- Choose where you want the PivotTable to be placed (new worksheet or existing worksheet).

- Use the PivotTable Field List to drag and drop fields into rows, columns, values, and filters to organise your data.

Customising PivotTables:

- **Sorting and Filtering:** You can sort and filter data within your PivotTable to focus on specific information.
- **Grouping Data:** Group data by date, number ranges, or other criteria to further analyse trends.
- **Calculated Fields and Items:** Create custom calculations within your PivotTable.

How PivotTables Work:

A PivotTable has four main areas where you can place fields from your dataset:

- **Rows**: Fields placed here create rows in the PivotTable. For example, a "Product" field in the rows area will list each product as a row.
- **Columns**: Fields in the columns area create columns in the PivotTable, such as breaking down sales figures by month.
- **Values**: This area is used for the data you want to analyse or aggregate, such as total sales, quantity sold, or average revenue.
- **Filters**: Filters allow you to focus on specific subsets of data within the PivotTable, such as limiting data to a certain region, product line, or date range.

Example of a PivotTable:

Suppose you have sales data for a company with columns for Date, Region, Product, and Sales Amount. Using a PivotTable, you can quickly summarise this data by:

- Placing **Region** in the Rows area to list each region in rows.
- Placing **Product** in the Columns area to show each product type across the top as columns.
- Placing **Sales Amount** in the Values area to show total sales for each product in each region.

The result is a compact summary table that lets you compare total sales across regions and products, making it easy to spot trends, such as the best-selling products by region.

PivotCharts: A PivotChart is an interactive chart in Excel that is directly connected to a PivotTable. Like regular charts, PivotCharts visually represent data, but they offer the unique ability to dynamically display the data summarised by the PivotTable. When you adjust the data in the PivotTable, the PivotChart updates automatically, making it ideal for real-time data analysis and reporting.

Creating a PivotChart:

- With your PivotTable selected, go to the **Insert** tab and choose a chart type from the **Charts** group.
- Customise your PivotChart as needed using the **Design** and **Format** tabs.

Example of a PivotChart:

Let us take the example of the abovementioned data where we have a PivotTable summarising Sales by Region and Product Type. You can create a PivotChart to visualise this data by:

- Using a **column chart** to show each region on the X-axis and sales totals as the height of each bar.
- Adding **filters** to allow users to view sales for specific time periods or to select only certain product types.
- As you add or delete fields in the PivotTable or modify filters, the accompanying PivotChart would dynamically update to clearly show the sales data across areas and product kinds.

8.2.6 Data Visualisation

The graphical representation of data is referred to as data visualisation, and its purpose is to effectively communicate information and insights to recipients in a clear and concise manner. Individuals are able to better comprehend patterns, trends, and outliers via the utilisation of data visualisation, which involves the transformation of raw data into visual representations. Excel provides its users with a broad variety of data visualisation tools that make it easy and convenient for them to generate charts, graphs, and other graphics. These tools assist in revealing insights that may be difficult to discern from a conventional table of numbers. Here are some common types of data visualisations:

1. **Column Charts:** Useful for comparing categories over time, like monthly sales or product popularity. Each column represents a category, and the height indicates its value.
2. **Bar Charts:** Similar to column charts but with horizontal bars, these are helpful for comparing quantities across categories, especially when category names are long.
3. **Line Charts:** These are ideal for displaying trends over time, such as monthly revenue, temperature changes, or stock prices. The line connects data points, showing how values change across a continuous interval.
4. **Pie Charts:** Represent parts of a whole, showing proportions. Each slice represents a category's contribution to the total. They're best for visualising data with a small number of categories.
5. **Scatter Plots:** Show relationships between two variables by plotting data points on an X and Y axis, ideal for identifying correlations.
6. **Heatmaps:** Use colour to represent data density or magnitude within a matrix of data points. Heatmaps help reveal patterns, such as high or low values across categories.

7. **Histograms:** Show the frequency distribution of a data set, making them effective for understanding the distribution of numerical data.

Key Benefits of Data Visualization:

1. **Simplifies Complex Data**: Visualisations make it easier to understand large datasets and complex relationships by distilling information into simple visual forms.

2. **Reveals Patterns and Trends**: Visual tools enable fast insights supporting decision-making by helping to detect patterns across time, clusters of data, and abnormalities.

3. **Enhances Memory Retention**: Individuals retain visual information more effectively than textual or numerical data, making visuals effective for presentations and reports.

4. **Improves Decision-Making**: Clear visualisations allow for more informed, data-driven decisions, as they provide clear insights at a glance.

   Let us see each of the visualisations below:

Example 1: Consider the following dataset. Plot **Sales Revenue** by **Month** using a column chart to show revenue trends over time.

Purpose: This allows us to see which months had the highest or lowest revenue at a glance.
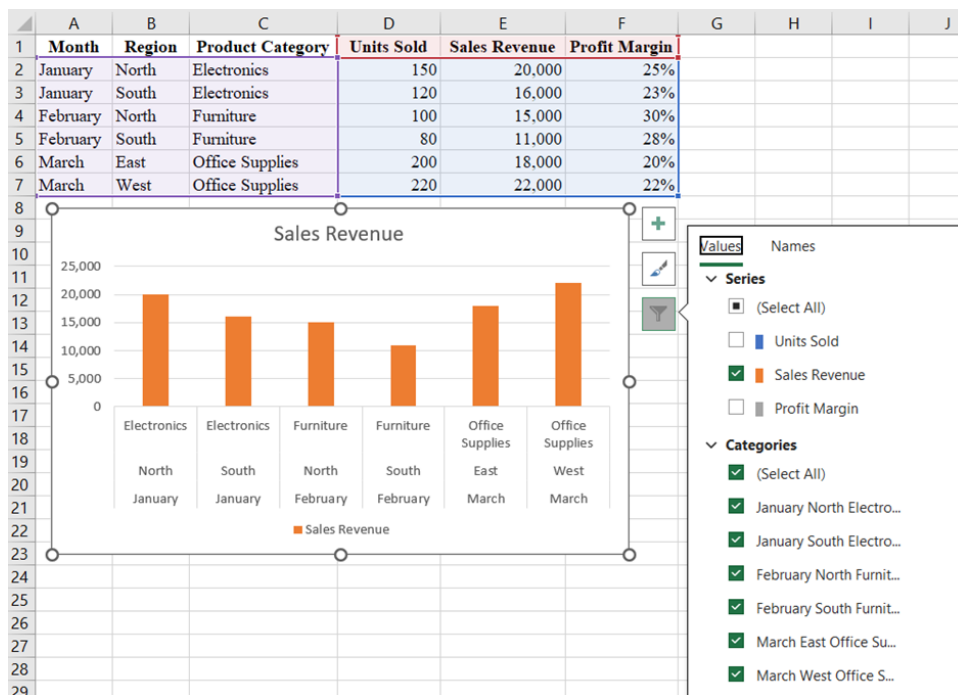
Fig 8.9: Column Chart showing Sales Revenue for each month

Example 2: Use a line chart to show Profit Margin over each Month.

Purpose: This reveals trends in profitability across months and regions.
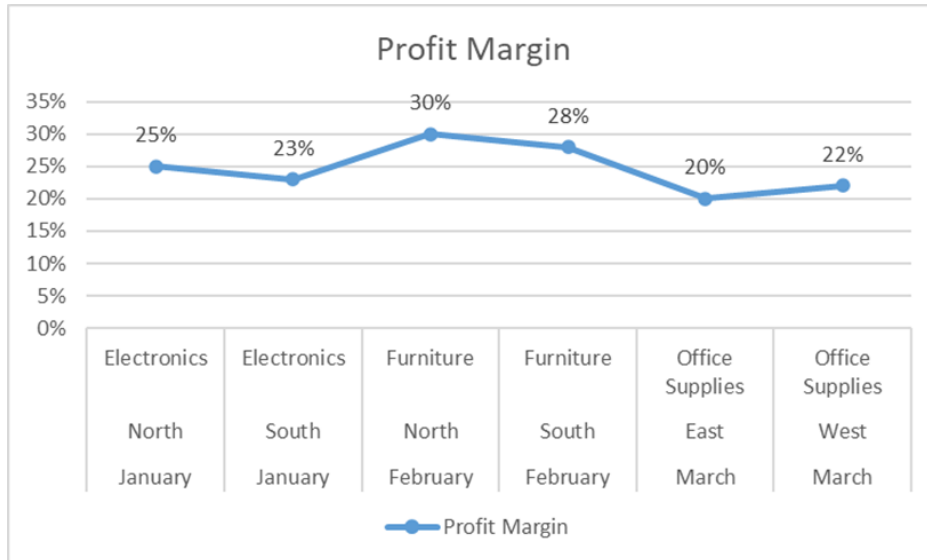
Fig. 8.10: A Line Chart

Example 3: Create a pie chart to represent the proportion of sales revenue by product category.

Purpose: This shows which product categories contribute the most to total sales for the year.
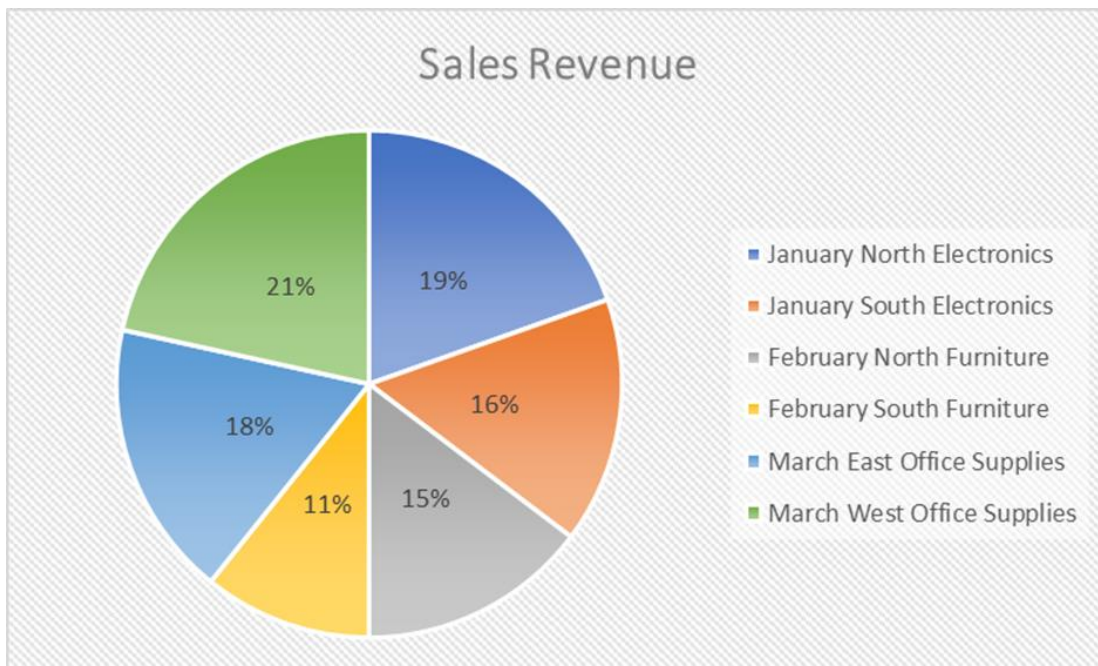
Fig. 8.11: A Pie Chart

8.2.7 Let Us Sum Up

In this Unit, we have learnt advanced functionalities and tools in Microsoft Excel that expand beyond basic usage, providing users with powerful capabilities for data analysis, automation, and presentation. Array formulas allow users to perform multiple calculations across ranges of cells with a single formula. By processing cell ranges rather than individual cells, array formulas facilitate

intricate computations, reducing the need for intermediate helper columns and improving worksheet organization. This approach not only enhances calculation speed but also ensures dynamic updates when underlying data changes, which is especially useful for large datasets. Array formulas in Excel are strong tools that can conduct sophisticated calculations on large amounts of data, making them valuable for advanced data analysis and reporting.

Logical functions are essential for conditional operations. These functions enable Excel to evaluate data based on specific conditions, making it possible to classify information, handle errors, and automate decision-making processes. The IF function checks if conditions are met and returns specified results based on whether the condition is true or false. The AND and OR functions work with multiple conditions, returning results only when all conditions (AND) or at least one condition (OR) is met. The NOT function reverses logical outcomes, adding flexibility in complex formulas. These logical functions are invaluable in decision-making scenarios, such as categorising performance data, flagging anomalies, or even filtering records based on multiple criteria. By mastering logical functions, you can create more dynamic and intelligent spreadsheets.

Lookup and Reference Functions which simplify the retrieval of data from large datasets. These functions help users locate specific values across tables or arrays, facilitating efficient data management and reporting. VLOOKUP and HLOOKUP search vertically and horizontally, respectively, for specific values in tables, while INDEX and MATCH allow more flexibility and accuracy by pinpointing exact positions within arrays. These functions are particularly beneficial in dynamic reporting, where information needs to be retrieved quickly based on changing criteria. INDEX-MATCH combinations offer an alternative to VLOOKUP that is less restricted by data layout, providing greater adaptability in complex lookup scenarios. With these functions, users can seamlessly access related data points from expansive tables, making Excel an effective tool for organising and analysing interlinked information across multiple sheets.

Text functions are essential for manipulating and formatting textual data within Excel. Functions like CONCATENATE, LEFT, RIGHT, MID, UPPER, LOWER, and TRIM allow users to modify text strings, whether combining different pieces of information, extracting specific parts, or changing case formats. These text functions are crucial when working with imported data that may require formatting adjustments to ensure consistency and readability. TRIM removes extra spaces, making data cleaner and easier to analyse, while CONCATENATE can merge fields, such as first and last names, into a single cell. The versatility of text functions simplifies data preparation and enhances

the usability of datasets, especially when text-based information needs to be standardised across large volumes of records.

Sorting organises data in a specified order, while filtering narrows down data to specific subsets based on set criteria. Conditional formatting visually highlights important data points, such as high and low values or duplicates, making patterns and trends more visible. PivotTables provide a dynamic way to summarise, organise, and analyse large datasets by allowing users to drag fields into rows, columns, values, and filters, customising data views without altering the original dataset. Linked to PivotTables, PivotCharts offer interactive graphical representations of summarised data, enabling visual data exploration that updates automatically when underlying PivotTable data changes.

8.3 Learning Outcomes

Now that you have completed the Unit, you can:
- Apply array formulas to perform calculations on multiple rows and columns simultaneously for more efficient data processing.
- Use logical functions like IF, AND, OR, and NOT to create decision-making formulas and automate conditional analyses.
- Work with functions such as VLOOKUP, HLOOKUP, XLOOKUP, and INDEX-MATCH to retrieve data efficiently from large datasets.
- Use text functions like CONCATENATE, TEXT, LEFT, RIGHT, and FIND to manipulate and format textual data effectively.
- Develop impactful data visualisations using advanced chart types, PivotCharts, and conditional formatting to present insights clearly and effectively.

8.4 Glossary

- **Formula:** A formula that does several calculations on a range of cells at once so that complicated calculations can be done on arrays instead of individual cells.
- **Function**: A group of functions (e.g., IF, AND, OR) that evaluate conditions and return TRUE or FALSE, thereby facilitating conditional operations and data-driven decision-making.
- **Formatting**: A function that graphically highlights trends, outliers, and important numbers by applying certain formatting—e.g., colours, icons—to cells depending on particular criteria.

- **Data Validation**: A feature that restricts data entry to specific types or ranges, ensuring data consistency and preventing input errors by allowing only valid entries in cells.
- **Data Visualisation**: The representation of data through graphical elements like charts and graphs, transforming raw data into clear, visual insights that help reveal patterns, trends, and outliers.

8.5 Sample Questions

8.5.1 Objective Questions

1. The CONCATENATE function is primarily used to:
   a. Calculate the sum
   b. Join multiple text strings into one
   c. Transpose data from rows to columns
   d. Perform conditional calculations

2. Which function would you use to locate the position of a specific value within a range?
   a. INDEX
   b. VLOOKUP
   c. HLOOKUP
   d. MATCH

3. What key combination is used to enter an array formula in Excel?
   a. Shift + Enter
   b. Alt + Shift
   c. Ctrl + Shift + Enter
   d. Ctrl + Shift + Alt

4. An advantage of using lookup functions (like VLOOKUP or INDEX-MATCH) is that they:
   a. Allow for easy retrieval of data across extensive tables
   b. Simplify the creation of pivot charts
   c. Automatically categorize text
   d. Help format data into charts

5. Which of the following is an advantage of using array formulas?
   a. They simplify sorting data
   b. They allow for complex calculations without helper columns

c. They are only used for single-cell calculations

d. They automatically create charts

6. _____ formatting in Excel is useful for highlighting data based on specific criteria, such as using colour scales to show performance levels or marking duplicate entries.

7. PivotTable allows users to quickly organise and summarise large datasets by dragging fields into four main areas: rows, columns, _____, and _____. .

8. Data visualisation transforms raw data into graphical representations like charts and graphs, helping to reveal_____, trends, and outliers that might not be easily spotted in a data table.

9. _____ formulas enable users to perform multiple calculations on one or more items in an array.

10. The _____ function is used to remove extra spaces from a text string, leaving only single spaces between words.

Answers:

1. Conditional
2. Values and filters
3. Patterns
4. Array
5. TRIM

8.5.2 Short Answer Questions

1. What is the primary use of the IF function in Excel, and how does it aid in data analysis?
2. Explain the advantages of using array formulas.
3. Describe the purpose of conditional formatting and give an example of when it would be useful.
4. Discuss the applications and advantages of logical functions in Excel.
5. Discuss the key steps involved in creating and customising PivotTables and PivotCharts to extract meaningful insights from large datasets.

8.5.3 Long Answer Questions

1. Explain the different types of charts and graphs available in Excel.
2. Analyse the use of the advanced Excel functions VLOOKUP, INDEX, and MATCH in performing complex data retrieval tasks. Demonstrate their usage with examples.

3. Evaluate the use of conditional formatting in managing and highlighting data in Excel. Provide examples.

4. Explain the concept of array formulas in Microsoft Excel and discuss their applications in performing complex calculations.

Practical Questions:

1. You have a table listing *Quantity Sold* (Column A), *Unit Price in Rupees* (Column B), and *Discount Percentage* (Column C). Calculate the total revenue by factoring in the discount for each row and summing up all results. Write an array formula to calculate the total revenue.

Quantity Sold (A)	Unit Price in Rupees (B)	Discount Percentage (C)
10.0	50.0	0.1
15.0	30.0	0.15
8.0	60.0	0.05
12.0	45.0	0.2
20.0	25.0	0.1
5.0	100.0	0.08
7.0	70.0	0.12
11.0	40.0	0.1
14.0	55.0	0.05

2. A store offers a discount to customers based on the following rules:

   ● The customer must have spent at least Rs. 500 in total.

   ● The customer must have purchased 3 or more items.

Given below is a table listing each customer's total spending and number of items bought. Use the IF, AND, and OR functions to create a formula that checks whether each customer is eligible for a discount. The formula should return "Eligible" if both conditions are met and "Not Eligible" otherwise.

3. In a list of items sold, some product names repeat. You need a distinct list of product names to analyse which products were sold without duplicates. Use a dynamic array formula to create a unique list of products in Column B.

Product Name (A)

Fan
Tubelight
Bulb
Television
Bulb
Refrigerator
Tubelight
Fan
Refrigerator
Geyser

4. Using the data below, create a pie chart to visualise the expense breakdown by category. Analyse which category takes up the largest and smallest portions of the budget.

Expense Category (A)	Amount (B)
Rent	Rs. 12,500
Groceries	Rs. 5,000
Utilities	Rs. 2,000
Transportation	Rs. 6,000
Entertainment	Rs. 1,500
Savings	Rs. 4,500

8.6 Suggested Learning Resources

Bluttman. *Microsoft Excel Formulas & Functions for Dummies.* 5th ed., Wiley, 2020.

Michaludis, John, and Bryan Hong. *101 Best Excel Tips & Tricks.* My Excel Online, 2022.

Unit-9: Email

Structure

9.0 Introduction

Email, which stands for "electronic mail," is a way to send files and notes over the internet. It is one of the most popular ways for people to talk to each other online these days, for both personal and business reasons. An email is a message that people send to each other using computers, cell phones, or other devices that can connect to the internet. Email lets you send messages right away, no matter how far away the receiver is, while regular mail needs to be printed out and delivered in person. In this Unit, you will learn about email in detail.

9.1 Objectives

By the end of this Unit, you will be able to:

- Explain the historical development and significance of email in modern communication.

- Describe how to set up and manage an email account effectively.
- Identify and utilise the key features of an email interface.
- Apply proper email etiquette in both professional and casual contexts.
- Develop skills to write clear, concise, and effective emails.
- Recognise and implement best practices for email security and privacy.

9.2 Email

An email usually contains:

- **The email address of the sender** (the individual who composes the message).
- **The email address of the receiver** (the person to whom the message is sent).
- **A subject line** (a brief description of what the message is about).
- **The main message** (the body of the email).
- **Attachments** (optional files like pictures, documents, or videos that can be included in the email).

Email has become an essential part of modern communication for several reasons:

1. **Instant Communication**: Unlike postal mail, email reaches the recipient almost immediately. You can exchange messages in real-time, making it faster and more efficient than traditional methods.
2. **Easy to Use**: Once you have an email account, sending and receiving messages is straightforward. Most people, even students and beginners, can learn to use email with just a little practice.
3. **Access from Anywhere**: As long as you have an internet connection, you can access your email from any device—your computer, tablet, or smartphone. This makes email convenient for staying in touch on the go.
4. **Formal and Informal Communication**: Email is flexible. You can use it to send a casual message to a friend or write a formal letter to a teacher or potential employer.
5. **Document Sharing**: Email allows you to attach documents, images, and other files, making it easy to share important information without needing to meet face-to-face.
6. **Organisation**: Emails are easy to organise, search, and store. Most email platforms allow you to categorise your messages, delete unnecessary ones, and keep important ones for future reference.

169

For students, email can be useful in a variety of ways:

- **Homework**: You can send assignments to teachers, ask questions about schoolwork, or collaborate with classmates on group projects.
- **Extracurricular Activities**: Email is often used to communicate about clubs, sports teams, or school events.
- **Connecting with Others**: Email is a wonderful way to stay in touch with family and friends who live far away.
- **Job Applications**: As you move into higher grades, you might use email to apply for part-time jobs, internships, or scholarships.

Compared to other digital communication tools like text messaging or social media, email is often seen as more formal and is widely used in professional settings. While texting is excellent for quick, casual conversations, email is more suitable when you need to communicate important information, ask formal questions, or send documents.

9.2.1 History of Email

Email has been around longer than the internet. In the 1960s, it was first used as a way for people who shared a mainframe computer to talk to each other.

1. Early Beginnings (1960s-1970s)

- 1960s: Large mainframe computers were used by universities and research institutions. These computers had simple messaging systems that allowed users to leave messages for each other. One of the earliest examples of this was a system called CTSS (Compatible Time-Sharing System) at the Massachusetts Institute of Technology (MIT), where users could leave messages for others sharing the same computer.
- 1971: American programmer Ray Tomlinson made the first email program work on the ARPANET system, the precursor to the internet. ARPANET was developed by the U.S. Department of Defense as a means to connect different research computers. Tomlinson used the "@" symbol to denote email addresses. This simple act of sending a message between two machines marked the birth of modern email. Tomlinson's system allowed users to send messages across different hosts, and the "@" symbol became a standard part of email addresses that we still use today.

2. Rise of Internet Email (1980s-1990s)

- 1982: The Simple Mail Transfer Protocol (SMTP) was introduced, which helped standardise how emails were sent and received, allowing different computer systems to communicate.

Email began to spread beyond research institutions, becoming more common among businesses and universities.

- 1989: After Tim Berners-Lee built the World Wide Web at CERN, things changed in a big way. Email became more user-friendly and accessible.

3. Growth of Email Services (1990s-2000s)

- 1990s: The internet became more accessible to the public, and email quickly became a popular means of communication for everyday users. With the advent of web-based email services like Hotmail and Yahoo Mail in the mid-1990s, people could send and receive emails through a web browser without needing specialised software. This greatly increased the ease and accessibility of email.

- 1996: In 1996, Hotmail, the first free web-based email service, came out. This was a big step forward for email usability. Sabeer Bhatia and Jack Smith changed the way people used email when they started Hotmail. Instead of needing dedicated software, users could simply log into their email accounts from any device with an internet connection and a web browser. This breakthrough allowed for unprecedented flexibility—people could check their email from anywhere in the world, making email truly mobile and versatile.

4. Modern Email (2000s-Present)

- 2004: A major turning point in the evolution of email came in 2004 when Google introduced Gmail. Unlike existing email services at the time, Gmail offered users an unprecedented 1 GB of free storage, which was significantly larger than what other providers were offering. This move disrupted the market, where most services were offering limited storage, forcing users to frequently delete emails to manage space. Gmail's approach allowed users to store years' worth of emails without worrying about space constraints. Additionally, Gmail revolutionised email with powerful search functionality, making it easier to find emails using keywords or filters. It also introduced threaded conversations, grouping related emails together, making it easier to follow the flow of discussions. These innovations set Gmail apart and forced competitors like Yahoo and Hotmail (now Outlook) to upgrade their services with more storage, better interfaces, and enhanced features.

- 2010s: Email integrated with other digital services, including social media and cloud storage.

- Present: Email remains a fundamental communication tool, continuously evolving with advancements in technology and security measures.

9.2.2 Setting up an email account

The process of creating an email account is simple and straightforward. The outline of the essential steps required to establish an email account is as follows:

1. Selecting an Email Service Provider: The initial stage entails selecting an email service provider (ESP). Popular email service providers (ESPs) include Gmail, Yahoo Mail, Outlook, and Rediffmail. Distinct features and functionalities are provided by each provider. It is advisable to choose an ESP that is in accordance with your unique requirements and preferences.
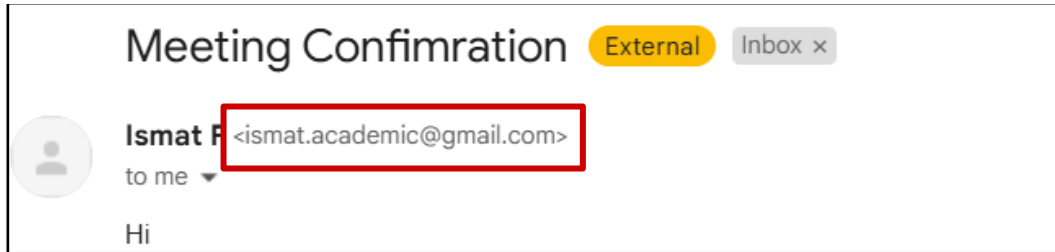
2. **Accessing the Provider's Website:** Navigate to the website of the ESP you have selected. For example, if Gmail is chosen, the website can be accessed at www.gmail.com.
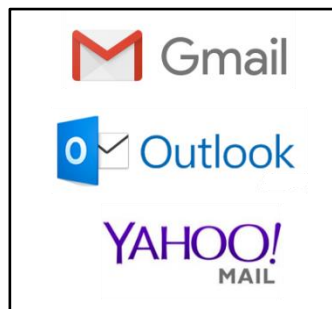
3. Initiation of Account Creation: Locate the icon on the website that initiates the account creation process. These buttons may be identified as "Sign Up" or "Create Account." To initiate the registration procedure, simply click on this icon.

4. Submission of the Registration Form: The registration procedure will typically necessitate the fulfilment of a form. This form can ask for personal details like your full name, date of birth, and cell phone number. Furthermore, you will be required to generate an exclusive username for your email address. The **username** is the name you choose to identify yourself. In your email address, the username will precede the "@" symbol (e.g., [yourusername]@gmail.com").
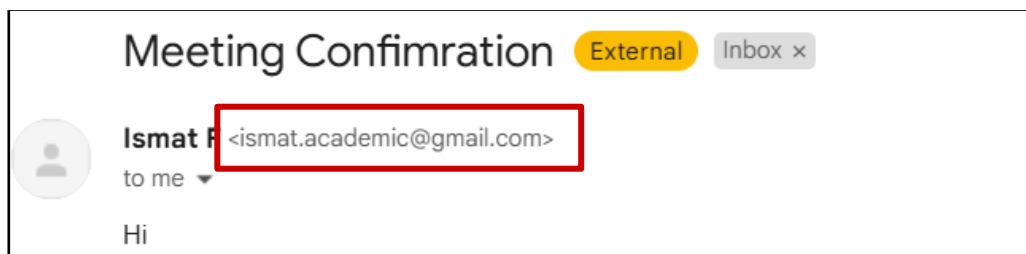
Some companies and organizations use email addresses that start with the domain name of their website. An example is shown below.
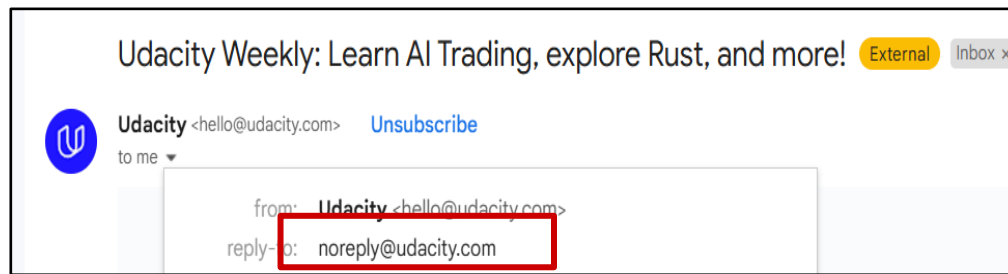
5. Establishing a Secure Password: The protection of your email account is contingent upon the use of a secure password. It is advisable to generate a password that includes a combination of special characters, numerals, and both uppercase and lowercase letters. Refrain from utilising information that is readily identifiable in your password, such as your name or birthday.

6. Verification of Identity: A verification code may be sent to your mobile phone number or another email address that you have supplied by the ESP. To verify your identity and complete the account creation process, enter this code.

7. Customisation of Account Settings: It is advised that you customise your account parameters after creating an account. This may entail the establishment of recovery options, such as an alternative email address or security queries. Furthermore, you have the ability to customise the layout of your inbox and modify your email preferences to suit your requirements.

8. Utilisation of Email Accounts: Once your email account has been established, you will be able to send and receive communications.

9.2.3 Email Interface and Features

An email interface is the visual layout and design of an email program or web-based service that allows users to send, receive, and manage emails. It is the visual and interactive component of the email application that comprises the inbox, folders, compose icon, search bar, toolbar, and other elements that assist in the management, organisation, and transmission of emails. It is intended to facilitate the intuitive and efficient process of viewing, composing, and navigating emails. Let us look at the components of the email interface in more detail.

1. Inbox: The Inbox is where all incoming emails are stored. New messages appear here, and they are usually organised by date, with the most recent ones at the top. You can click on any email to open and read it.

2. Compose: The "Compose" or "New Message" button allows you to create and send a new email. Clicking this button opens a blank email form where you can type your message and add

recipients.

3. To, CC, and BCC Fields:

- **To:** This is where you enter the email addresses of the main recipients.
- **CC (Carbon Copy):** This field is used when you want to send a copy of the email to other people, besides the main recipients.
- **BCC (Blind Carbon Copy):** This is similar to CC but with one key difference: the email addresses in the BCC field are hidden from other recipients.

4. Subject Line: The subject line is a brief description of the email's content. It helps the recipient understand the purpose of the message before opening it. Always keep the subject line clear and concise.

5. Body: The body is the main content area where you write your message. It can contain plain text or be formatted with different fonts, colours, and styles. Some email platforms also allow you to insert images, hyperlinks, and other multimedia.

6. Attachments: Attachments are files that you can include with your email, such as documents, images, or PDFs. The "Attach" or "Paperclip" icon is usually used to upload files from your computer or mobile device to the email.

7. Send Button: Once you have written your email and added any necessary attachments, the "Send" button is used to deliver the email to the intended recipients.

8. Drafts: If you start writing an email but aren't ready to send it, most email platforms automatically save it in the "Drafts" folder. You can come back to it later, complete it, and send it when you are ready.

9. Reply, Reply All, and Forward

- **Reply:** Clicking "Reply" allows you to respond to the sender of the email.
- **Reply All:** This option sends your response to everyone included in the original email, not just the sender.
- **Forward:** Use this feature to send a copy of the received email to a new person or group of people.

10. Trash/Spam

- **Trash:** Emails you delete move to the Trash folder. You can recover them from there or permanently delete them.
- **Spam:** Suspicious or unwanted emails are often automatically moved to the Spam folder. Always be cautious when dealing with emails in this folder, as they might

contain harmful links or attachments.

11. Search

The Search feature helps you quickly find emails by typing in keywords, sender names, or dates. It is useful when you have a large volume of emails and need to locate a specific one.

12. Labels and Folders

Emails can be organised into folders or labelled for easy access. For example, you might create folders for "Work," "Family," or "Receipts" to sort your emails based on different categories. Almost every web-based email service offers a mobile app that includes all the necessary features, available for both Android and iOS users. The interface for mobile viewing is similar to that of a desktop layout, only compact and more small-screen friendly. Now let us look closer at the features of email:

1. Compose and Send

Compose: Create new emails using a compose window.

Send: Send emails to one or multiple recipients instantly.

2. Inbox and Organisation

Inbox: Stores received emails.

Folders/Labels: Organise emails into categories for easier management.

3. Search and Filters

Search: Find specific emails using keywords, sender names, or other criteria.

Filters: Automatically sort incoming emails into folders or apply labels based on rules you set.

4. Attachments: Attach files, such as documents, images, or videos, to your emails.

5. Drafts: Save partially composed emails and finish them later.

6. Contacts: Store and manage email addresses of your contacts for quick access.

7. Spam/Junk Filters: Automatically identify and move unsolicited emails to a spam or junk folder.

8. Reply and Forward

Reply: Respond to the sender of an email.

Reply All: Respond to all recipients of an email.

Forward: Send a received email to a new recipient.

9. Email Threads/Conversations: Group related emails together for easy tracking of ongoing discussions.

10. Customisable Settings:

Themes: Change the look of your email interface.

Notifications: Set up alerts for new emails.

Signatures: Automatically add a predefined signature to the end of your emails.

11. Security Features

Encryption: Protect the contents of your emails.

Two-factor authentication: Add an extra layer of security to your account.
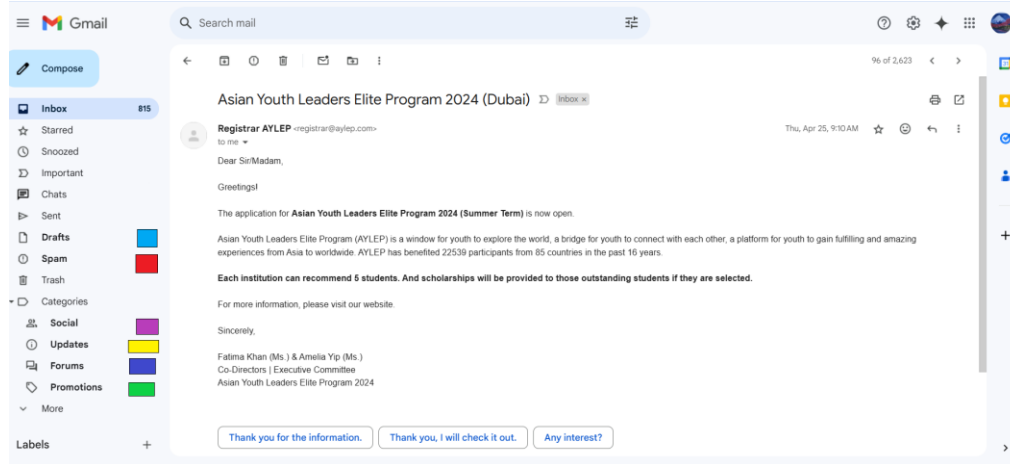
Check your progress:

1. What does the "CC" field in an email stand for?

_____

9.2.4 Email Etiquette

Email etiquette refers to the proper and respectful way of communicating through email. It involves writing emails that are clear, concise, and effective, guaranteeing that the message is readily comprehensible and positively accepted by the receiver. Good email etiquette includes using appropriate greetings and closings, maintaining professionalism, avoiding slang, and being mindful of the recipient's time and privacy. These principles facilitate the establishment of successful, efficient, and polite communication, applicable to both personal and professional relationships. Let us now see the ways in which we can maintain this etiquette.

1. **Use a Clear Subject Line:** Your subject line should summarise the email's content in a few words. It helps the recipient understand the purpose of your email right away. A vague or misleading subject line may result in your email being ignored or misunderstood.

Example:

Subject: Meeting Agenda for February 19th.

2. Start with a Proper Greeting: Use a polite and appropriate greeting. The level of formality should match your relationship with the recipient. For formal communication, use greetings like "Dear" or "Hello," followed by the person's name and title, if applicable. For more casual emails, "Hi [Name]" works well.

Example:

Dear Professor Khan,

Hello Mr. Santosh,

3. Be Concise and to the Point: Keep your emails short and focused. Avoid overloading your message with unnecessary details. This shows respect for the recipient's time. If you need to break up information and make it easier to understand, use short lines and bullet points.

Example:

I am writing to inform you about the upcoming project deadline on November 17th. Please ensure that all your submissions are completed by this date.

4. Use Proper Grammar and Punctuation: Spelling and grammatical errors can reflect poorly on the sender. Always take a moment to proofread your email before hitting send. Simple mistakes can easily be avoided by reviewing your message for clarity, tone, and accuracy.

Tip: Reading your email aloud will enable you to find mistakes you would otherwise overlook.

5. Be Professional and Polite: Even in casual settings, it is important to maintain professionalism in emails. Avoid slang, jargon, or overly casual language in business correspondence. If the email is critical or involves a sensitive issue, remain courteous and avoid using a harsh or confrontational tone.

Example:

I appreciate your feedback and will take it into consideration for future projects.

6. Use a Polite Closing: End your email with a professional closing. Phrases such as "Best regards," "Sincerely," or "Thank you" are commonly used and convey respect. Always include your full name and, if applicable, your position or contact information.

Example:

Best regards,

Raza Quadri

Project Manager, SMR Ltd.

7. **Be Mindful of Attachments**

If you are including attachments, mention them in the body of the email. Often, we say in the email that we have attached a file but fail to actually attach it. Double-check that you have attached the correct file(s) before sending. It is also helpful to keep file sizes reasonable and use widely accessible formats. ***Example***:

Please find the marks list attached for your perusal.

8. Respect Privacy: Use "Cc" (carbon copy) and "Bcc" (blind carbon copy) appropriately. Avoid sharing someone's email address with others without their permission. Use "CC" (carbon copy) for keeping others in the loop who should be aware of the email but are not the primary recipient. "BCC" (blind carbon copy) should be used sparingly, primarily to protect the privacy of recipients when sending group emails.

Example:

CC: Vijay Sarathi (for awareness)

BCC: Client distribution list (to maintain confidentiality)

9. Reply Promptly: Responding promptly to emails shows respect of the sender's time and professionalism. Although you might not always be able to respond right away, attempt to review significant emails within 24 hours.

Tip: If you need more time to provide a full response, send a quick acknowledgement and let the sender know when they can expect a detailed reply.

10. Avoid Using All Caps: Typing in all caps can come across as shouting. Use regular case to communicate in a more friendly and professional manner.

Example:

Instead of: *PLEASE REVIEW THE DOCUMENT*

Use: *Please review the document.*

9.2.5 Everyday Examples

By following proper email etiquette, you can ensure that your communication is clear, respectful, and professional. In today's fast-paced digital world, emails often serve as the first point of contact, and how you compose your message can leave a lasting impression. Thoughtful subject lines, courteous greetings, and well-structured content can help you convey your message efficiently while showing respect for the recipient's time. Additionally, professionalism is demonstrated not only through the tone and content but also in how quickly and accurately you respond. Careful proofreading

shows attention to detail, while mindful use of CC and BCC ensures that information is shared appropriately without overwhelming others. In the long run, mastering these practices not only improves your communication skills but also strengthens your professional relationships. Whether it is a quick note or an important business proposal, maintaining high standards of email etiquette will always reflect positively on you as a communicator.

Some example emails are given below to help you know how an effective email can be written.

Example 1: Formal Email

Subject: Meeting Confirmation

Dear Mr. Arya,

I am writing to verify our November 12th meeting at 3 PM is confirmed. Tell me whether the timetable has changed or whether you want any further information prior.

I appreciate your time and attention.

Best regards,

Anshuman Sawant, HR Manager, DT Paints Ltd.

Example 2: Formal Email

Dear Ms. Prasanna,

I am writing to request a meeting to discuss the progress of the XYZ project. Could we schedule a time next week that works for you?

Thank you for your time and consideration.

Best regards,

Shanti Priya

Example 3: Informal Email

Subject: Catching Up!

Hey Noor,

Long time no see! How have you been? Let's grab coffee sometime next week and catch up.

Cheers,

Shahid.

Example 4: Complaint Email

Subject: Complaint Regarding Order #12345

Dear Customer Service

I am writing to let you know that I am not happy with the most recent order I got. Arriving, the merchandise was damaged. Please suggest how this problem could be fixed.

Regards,

Sai Kumar

Example 5: Job Application Email

Subject: Application for Marketing Manager Position

Dear Hiring Manager,

I am submitting my application for the Marketing Manager position at XYZ Company. Enclosed are my resume and cover letter for your consideration. I anticipate the opportunity to explore how my talents and experiences correspond with your requirements.

Best regards,

Mirza Farhan Baig

Example 6: Promotional/marketing Email

Subject: Special Offer Just for You!

Hi [Customer Name],

We are excited to offer you a 20% discount on your next purchase. Use code SAVE15 at checkout. Hurry, this offer ends soon!

Best,

The Binge Books Team

9.2.6 Managing emails

Effectively managing your emails is crucial for staying organised and ensuring timely communication. With the volume of emails people receive daily, it is easy to become overwhelmed, leading to missed messages or delayed responses. Here are several strategies and tips to help manage your inbox efficiently and keep your email communication under control:

1. Organise Your Inbox with Folders and Labels: Create specific folders or labels to categorise your emails. This system allows you to sort emails by topic, sender, or urgency, making it easier to find messages when needed. For example, you might have folders for "Work," "Personal," "Projects," or "Invoices." Most email services allow you to set up filters that automatically sort incoming emails into these folders based on specific criteria, such as keywords or the sender's address.

Tip: Use colour-coded labels for different categories to make scanning your inbox quicker.

2. Set Priorities with Email Flags or Stars: Many email platforms have features like flags or stars that let you mark important emails for follow-up. This ensures that you don't forget to address critical messages. You can also assign different levels of importance to prioritise responses.

Example: Flag emails that require immediate action and star those that need a response within the week.

3. Use Filters and Rules: Filters and rules can help you automatically manage incoming emails. By setting up filters, you can direct certain types of emails to specific folders, mark them as read, or even delete them. This is particularly helpful for managing newsletters, promotional emails, and automated messages that do not require immediate attention.

Example: Set a filter for promotional emails from online stores to go directly into a "Promotions" folder.

4. Unsubscribe from Unnecessary Mailing Lists: If you find your inbox cluttered with newsletters, promotions, or updates you no longer read, it is a good idea to unsubscribe. This will reduce the number of unwanted emails and make it easier to focus on important messages. Most emails from mailing lists will have an "Unsubscribe" link at the bottom of the email.

Tip: Be selective about which newsletters or promotional offers you subscribe to in the future to keep your inbox clean.

5. Practice the "Inbox Zero" Approach: The "Inbox Zero" method, popularised by productivity expert Merlin Mann, involves keeping your inbox as close to empty as possible. The goal is to take immediate action on emails—either responding, deleting, filing, or deferring them for later—so that your inbox remains uncluttered. This method can reduce the mental load of dealing with an overflowing inbox.

Tip: Set aside specific times during the day to clear out your inbox instead of constantly checking emails.

6. Schedule Time for Email Responses: Constantly checking and replying to emails throughout the day can disrupt your workflow and reduce productivity. Instead, schedule specific times to go through your inbox and respond to messages. This can be in the morning, after lunch, or at the end of the workday, depending on what works best for your schedule. Sticking to a schedule allows you to focus on other tasks without the constant distraction of email notifications.

Tip: Disable email notifications during non-checking hours to maintain your focus.

7. Use the Search Function Effectively: Instead of scrolling through hundreds of emails to find what you need, use the search function available in your email platform. Learn to use advanced

search techniques by entering keywords, dates, or specific senders. This can save a lot of time when looking for old messages or attachments.

Example: Use search terms like "Invoice from last month" or "Email from Sarah" to quickly locate specific messages.

8. Archive Old Emails: For emails that don't require an immediate response but you want to keep for reference, archiving is a useful feature. Archived emails are moved out of your inbox but remain searchable. This helps declutter your inbox without permanently deleting important information.

Tip: Regularly archive older emails to maintain a clean and manageable inbox.

9. Respond Promptly to Important Emails: Managing emails effectively doesn't just involve sorting and organising; it is also about maintaining good communication habits. Aim to respond to important emails within 24 hours, even if it is just to acknowledge the message and let the sender know when they can expect a full response. This keeps your communication professional and prevents important matters from slipping through the cracks.

10. Regularly Clean Up Your Inbox: Set aside time periodically to clean up your inbox. Delete or archive old messages, remove unnecessary folders, and ensure that your organisational system still meets your needs. This practice will help keep your inbox tidy and make managing future emails easier.

Tip: A good time to perform an inbox cleanup is at the end of each week or month to start fresh.

By implementing these strategies, you can control your inbox, reducing stress and improving productivity. Managing your emails efficiently ensures that important messages don't get lost, allows you to respond promptly, and helps you maintain a clean and organised workspace—both digitally and mentally.

9.2.7 Email security and privacy

In today's digital world, keeping your email account safe and secure is crucial. Here's how to ensure you're protecting yourself and your information:

1. Create strong passwords: A strong password serves as your first line of defence. It must comprise a combination of uppercase and lowercase letters, numerals, and special characters. Refrain from using popular passwords such as "123456" or "password." Avoid selecting conspicuous options

such as your name or birthdate. Regularly update your password and refrain from reusing passwords across many websites.

2. Identify phishing and spam emails: Phishing emails are designed to appear authentic but are intended to extract your personal information. Consistently verify the sender's email address and be vigilant for indicators such as typographical errors or atypical hyperlinks. If something appears suspicious, refrain from clicking on links or downloading files.

3. Activate two-factor authentication: Two-factor authentication (2FA) enhances security by necessitating an additional verification method. Even if someone acquires your password, they would still require the secondary verification mechanism (such as a code transmitted to your phone) to have access to your account.

4. Employ encryption: Encryption guarantees that your email content is accessible just to the designated recipient. Seek email providers that include integrated encryption. This is especially crucial when transmitting sensitive information to safeguard it against interception by third parties.

5. **Keep Your Software Up to Date**: Software updates frequently incorporate security patches that safeguard against the most recent threats. Regularly upgrade your email application, browser, and operating system to take advantage of the newest security enhancements.

6. Exercise Caution with Personal Information: Reconsider before disclosing sensitive data such as your social security number or banking information by email. Consistently confirm the recipient's email address to ensure your message is directed to the correct individual.

7. Monitor Your Account Activity: Consistently review the recent activity area in your email settings to detect any unauthorised access. Upon observing unexpected actions, such as logins from unrecognised devices, promptly alter your password and notify your email provider of the situation.

9.2.8 Practical Applications

Email has evolved into a versatile tool that serves countless purposes in both personal and professional spheres. What started as a simple form of digital correspondence has become integral to business operations, marketing, education, and much more. Its ability to send messages quickly, share documents, schedule events, and manage communication with people worldwide makes email an indispensable part of modern life. Whether it is used for sending a formal business proposal, applying for a job, or simply staying in touch with friends, the practical applications of email are vast and varied. In this section, we explore some of the key uses of email and how it has become a critical tool for communication and productivity.

1. Professional Communication: In the business world, email serves as a primary channel for formal communication. It is used for exchanging ideas, discussing projects, scheduling meetings, sharing documents, and more. Emails help maintain clear and professional records of interactions between colleagues, clients, and partners. Organisations often rely on email to send updates, issue instructions, or announce changes to policies and operations.

Example: Managers can use email to assign tasks to employees, while teams can collaborate on projects by sharing updates and files through email.

2. Marketing and Advertising: Email marketing is one of the most cost-effective ways for businesses to reach their target audience. Organisations use emails to send promotional offers, newsletters, product updates, and special announcements to current and potential customers. With the ability to personalise messages and segment audiences, email marketing helps businesses build relationships and increase customer engagement.

Example: A company may send out a monthly newsletter to its customers, containing product news, upcoming sales, and tailored offers based on customer preferences.

3. Job Applications and Recruitment: Email plays a crucial role in the job application process. Job seekers submit resumes and cover letters via email, while recruiters communicate interview schedules, feedback, and hiring decisions through this medium. It provides a formal and traceable way to manage recruitment correspondence, making it essential for job-related communications.

Example: Candidates email their resumes to potential employers, and employers respond with interview invitations or next steps in the hiring process.

4. Academic Communication: Email is extensively used in educational institutions for correspondence between students, teachers, and administrative staff. Teachers use email to share assignments, provide feedback, and communicate important notices, while students use it to ask questions, submit work, or receive guidance. Universities also use emails to send official communications such as exam schedules, fee deadlines, and course updates.

Example: A student may email their professor to ask for clarification on an assignment, or a university might send out an official email informing students about upcoming registration dates.

5. Personal Communication: Although instant messaging and social media platforms have become more popular for casual communication, email is still used for more formal or detailed personal messages. It is particularly useful for sharing longer updates, sending attachments, and keeping in touch with people over distances.

Example: A person might email a detailed life update to a distant relative or use email to exchange travel plans with a group of friends.

6. File and Document Sharing: One of the most common practical uses of email is for sending files and documents. Emails allow users to easily share attachments such as PDFs, Word documents, images, and other files. This is especially useful in professional environments where contracts, reports, or proposals need to be shared. Many email providers also offer cloud storage integration, allowing users to send large files via links.

Example: A team member might send a project proposal as a PDF attachment to colleagues for review.

7. Customer Support and Service: Many companies use email as a tool for customer support. Customers can send inquiries, complaints, or feedback via email, and companies can respond with solutions, troubleshooting tips, or follow-up actions. Email support is a key element in customer service, as it allows companies to track correspondence and ensure timely responses.

Example: A customer might email a tech support team regarding an issue with a product, and the company responds with troubleshooting steps or a resolution.

8. Project Management and Collaboration: Email is a valuable tool for team collaboration and project management. Teams can use email to share updates, assign tasks, distribute meeting agendas, and discuss ongoing projects. Although many organisations use dedicated project management software, email still plays a complementary role in providing communication and documentation.

Example: A project manager might email team members to share project milestones, upcoming deadlines, and status updates.

9. Legal Documentation and Records: Emails are often used to send legal documents and formal notices because they provide a written record of communication. Legal agreements, contracts, terms of service, and other formal documents are frequently shared and discussed over email, with timestamped records serving as important documentation for legal purposes.

Example: A company may send a contract for signing via email, while legal teams exchange formal communications about agreements.

10. Scheduling and Appointments: Email is often used to schedule appointments, meetings, and events. With calendar integration features available in most email platforms, users can send meeting invitations and reminders directly through email. This makes it easy to coordinate with multiple parties and ensure everyone is aware of the scheduled time and place.

Example: A business professional might send a meeting request to clients or colleagues through email, which includes a link to add the event to their calendars.

9.2.9 Let Us Sum Up

This Unit provides an introduction to the essential skills and knowledge needed to effectively use email as a communication tool. It covers the fundamental components of email, including understanding its structure, the function of key fields (To, CC, BCC, Subject, and Body), and the importance of clear, concise communication.

It also shows how to compose professional emails, including appropriate tone, language, and formatting, ensuring their messages are respectful and effective for different audiences. The Unit also emphasises proper email etiquette, guiding students on how to interact courteously in both formal and informal contexts.

In addition to composing emails, you have explored how to organise your inbox using folders, labels, and filters, making it easier to manage large volumes of email. Key features such as attaching files, replying, forwarding, and using email signatures will be demonstrated, along with an emphasis on the security risks associated with email, such as phishing and malware.

The Unit concludes with a focus on privacy and confidentiality in email communication, as well as best practices for protecting personal and sensitive information. You are equipped with the foundational skills to use email efficiently and securely in both personal and professional settings.

9.3 Learning Outcomes

Now that you have completed this Unit, you can:
- Explain the basic concepts of email, including how email works and the components of an email (subject line, body, signature, attachments)
- Write clear, concise, and professional emails, using appropriate language, tone, and structure for different contexts (e.g., formal, semi-formal, or casual emails).
- Demonstrate proper email etiquette, including the use of greetings, closing statements, and formatting to ensure emails are respectful and effective.
- Utilise essential features of email platforms, such as replying, forwarding, attaching files, and adding recipients in the To, CC, and BCC fields.

- Organise and manage their inbox effectively using folders, labels, and filters to categorise emails and maintain a clutter-free inbox.
- Explain the concepts of email privacy, confidentiality, and the legal aspects related to email communication, including the proper use of BCC and data protection regulations.

9.4 Glossary

- **SMTP:** Simple Mail Transfer Protocol, a protocol for sending emails across networks.
- **Inbox:** The folder where incoming emails are stored.
- **Attachment:** A file sent along with an email message.
- **Phishing:** The deliberate attempt to access private data by passing for a reputable organisation via email correspondence.
- **Encryption:** The process of converting information into a secure format to prevent unauthorised access.
- **Two-Factor Authentication (2FA):** An additional security layer requiring two forms of identification to access an account.
- **Spam:** Unsolicited and often irrelevant or inappropriate emails sent in bulk.
- **BCC:** Blind Carbon Copy, a field in an email that hides the recipients listed from each other.
- **Inbox Zero:** A method of managing emails to keep the inbox empty or nearly empty at all times.

9.5 Sample Questions

9.5.1 Objective Questions

1. What does SMTP stand for?
    a. **Simple Mail Transfer Protocol**
    b. Secure Mail Transfer Protocol
    c. Simple Message Transfer Protocol
    d. Secure Message Transfer Protocol
2. Who implemented the first email program?
    a. Tim Berners-Lee

b. **Ray Tomlinson**

c. Sabeer Bhatia

d. Jack Smith

3. Which email service was the first to offer 1 GB of free storage?

a. Yahoo Mail

b. Hotmail

c. **Gmail**

d. Rediffmail

4. What is the purpose of the BCC field in an email?

a. To send a copy of the email to other recipients

b. **To hide the recipients listed from one another**

c. To attach files to the email

d. To mark the email as important

5. What is the primary function of encryption in email?

a. To organize emails

b. **To protect the contents of emails**

c. To filter spam emails

d. To send large attachments

6. Which of the following is NOT a component of an email interface?

a. Inbox

b. Compose button

c. Subject line

d. **Browser**

7. What does the "Inbox Zero" approach aim to achieve?

a. **Keeping the inbox empty or nearly empty**

b. Organizing emails into folders

c. Filtering spam emails

d. Sending emails to multiple recipients

8. What should you do if you receive a suspicious email?

a. Click on the links

b. Download the attachments

c. **Verify the sender's email address**

      d.   Forward it to friends

9. Which feature helps you find specific emails quickly?

      a.   Filters b. Labels c. **Search** d. Folders

10. What is the main advantage of using two-factor authentication?

      a.   It makes emails easier to organize

      b.   It provides an extra layer of security

      c.   It allows sending large attachments

      d.   It filters spam emails

9.5.2 Short Answer Questions

1. What is the primary purpose of email?
2. How did Ray Tomlinson contribute to the development of email?
3. What are the key components of an email interface?
4. Why is email etiquette important?
5. What is the "Inbox Zero" approach?
6. How can you ensure the security of your email account?
7. What is phishing, and how can you identify it?
8. Why is it important to use strong passwords for email accounts?
9. How can email be used in professional communication?
10. What are the benefits of using email for file sharing?

9.5.3 Long Answer Questions

1. Discuss the historical development of email from its early beginnings to the present day.
2. Explain the steps involved in setting up an email account and the importance of each step.
3. Describe the various features of an email interface and how they contribute to effective email management.
4. Analyse the role of email etiquette in professional and personal communication, providing examples.
5. Describe the practical applications of email with examples.

9.6 Suggested Learning Resources

Vermani, Yogesh. *Email Writing for Beginners: Examples, Etiquette, and Mistakes.* 2019.

Wallace, M., and Philippa Wingate. *The Usborne Guide to E-mail.* EDC Publishing, 2004.

Unit-10: Cloud Service

Structure

10.0 Introduction

Consider a world where you can access your files, run your program, and store your data on any device, anytime. It marks a departure from traditional computing, in which resources like servers, storage, and networking were physically hosted on-site. Unlike on their home computer or local network server, cloud computing lets users store, manage, and process data over the internet. Simply defined, as long as an internet connection is available, it is a method of accessing data and apps from anywhere in the globe.

With cloud computing, we can eliminate the hassle of carrying physical storage devices like USB drives and the worry of losing files stored on a single device. Cloud computing involves the storage of all data "in the cloud," which refers to remote servers that are remotely hosted by providers such as Amazon, Microsoft, and Google. Organisations and people can utilise these resources on-demand, paying just for what they need rather than owning and maintaining actual servers or data centres. This model offers unparalleled flexibility, scalability, and cost-efficiency.

10.1 Objectives

By the end of this Unit, the student will be able to:

- Define cloud computing and differentiate it from traditional computing.
- Identify the key characteristics and benefits of cloud services.
- Explain the different cloud service models.
- Describe core cloud services.
- Evaluate the suitability of cloud services for various workloads.

10.2 Cloud Service

10.1 Importance of Cloud Computing

Here is a list explaining the benefits and importance of cloud services.

- **Cost-effectiveness:** Users can gain access to advanced computing resources and storage without owning or maintaining physical servers, reducing both upfront and continuing expenditures.
- **Scalability:** Users of cloud services can scale resources in response to demand either up or down. For companies experiencing seasonal fluctuations or sudden consumption spikes, this adaptability is absolutely vital.
- **Collaboration and Accessibility:** Data saved in the cloud is accessible from anywhere, allowing individuals and teams to collaborate remotely. This has been especially useful in the context of remote work and worldwide connectivity requirements.
- **Speed and Performance:** Cloud computing companies operate large data centres with high-performance infrastructure, ensuring that applications and services function swiftly and reliably.
- **Security and Backup:** Cloud companies provide strong security measures and automatic backups, lowering the chance of data loss and improving data protection.

Now that we know its advantages, let us see the characteristic features of cloud services:

- **On-demand Self-service:** Users of computing resources can make necessary usages without consulting the service provider. This means you can easily add more storage, processing power, or software applications whenever you need them.

- **Broad Network Access:** Laptops, telephones, and tablets are among the devices that can access cloud services available online. This guarantees that consumers may access their apps and data practically from any location, allowing for increased flexibility and cooperation.

- **Resource Pooling**: Multi-tenant models let cloud providers handle numerous clients using shared computer resources. Demand-driven dynamic allocation drives dynamic allocation and reallocation of these resources; so, reallocation of these resources guarantees best efficiency and usage.

- **Rapid elasticity:** Cloud services let you rapidly scale up or down to satisfy evolving needs. This means you can effectively control changing workloads, guaranteeing that you always have the right level of resources without overprovisioning.

- **Measured Services:** Cloud computing offers a pay-as-you-go pricing model that charges customers according to the resources they use. This helps to optimise costs because consumers only pay for what they use, avoiding the cost of idle resources.

10.2.2 Evolution of Cloud Computing

Cloud computing, as we know it, is the consequence of decades of technological progress. From early dreams of shared computer systems to the evolution of the contemporary internet and the rise of big data, cloud computing has transformed how we store, process, and access information. Here's a detailed overview of the important stages in the evolution of cloud computing.

1. The Concept of Shared Computing Resources (1960s).

- **Vision of Computing as a Utility:** The concept of computing as a utility first emerged in the 1960s. John McCarthy, a computer scientist and pioneer in artificial intelligence, proposed that "computing may someday be organised as a public utility" like electricity. This theory suggested the possibility of remote and on-demand access to processing power.

- **Time-sharing Systems:** During this period, time-sharing became a common computing model. It let numerous users access a central computer's resources simultaneously by sharing CPU time. Companies such as IBM created mainframe computers with time-sharing capabilities, paving the way for future cloud services.

- **ARPANET: the United States Department of Defence supported the construction of the ARPANET (Advanced Research Projects Agency Network), marking a significant milestone.** ARPANET, the predecessor to the contemporary internet,

demonstrated that computer networks could connect multiple users over large distances.

2. Advances in virtualisation (1970s-1980s)

- **Virtual Machines (VMs):** In the 1970s, IBM created virtualisation technology that enabled a single computer to function as numerous independent machines. Virtual machines (VMs) accomplished this by emulating various operating systems on a single physical machine. Virtualisation became a key technology for cloud computing since it facilitated the optimal use of hardware resources.

- **Client-Server paradigm:** In the 1980s, the client-server paradigm emerged, in which servers stored applications and data that clients accessed remotely. This enabled more centralisation of computer resources and paved the way for future cloud infrastructure.

3. The Rise of the Internet (1990s)

- **World Wide Web:** The advent of the World Wide Web in the early 1990s allowed browsers to retrieve information and resources, facilitating the dissemination of data and applications via the internet.

- **Application Service Providers (ASP):** Originally founded in 1999, Salesforce invented the Software as a Service (SaaS) paradigm by offering online customer relationship management (CRM) tools. By offering software apps over the internet instead of on local workstations, ASPs cleared the door for SaaS.

4. The Rise of Cloud Computing Services (2000s)

- **Amazon Web Services (AWS):** In 2006, Amazon developed the Elastic Compute Cloud (EC2) service, which allows organisations to rent virtual computers to execute their applications. EC2 was a game changer because it offered on-demand, scalable computing capacity at low pricing, ushering in the era of mainstream Infrastructure as a Service (IaaS).

- **Google and Microsoft Join the Cloud:** Google and Microsoft have followed Amazon's lead and created their own cloud services. Google debuted Google App Engine, a Platform as a Service (PaaS) in 2008 that let developers create and run web apps on Google's systems. When Microsoft debuted Azure in 2010, it offered Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) options.

- **Dropbox and Consumer Cloud Storage:** Cloud storage for consumers gained popularity with services such as Dropbox, which started in 2007 and allows users to

store and exchange data on the cloud. This made cloud technology more accessible to regular people.

5. Rapid Growth and Expansion (2010s)

- **Hybrid Cloud and Multi-Cloud Environments:** As organisations embraced cloud computing, hybrid and multi-cloud models gained popularity. Whereas a multi-cloud approach uses several cloud providers, a hybrid cloud mixes on-site infrastructure with cloud services. These models provided flexibility, enabling businesses to optimise costs and resources.

- **Big Data and Cloud Computing:** The 2010s saw the emergence of big data, with cloud computing allowing for the storage and processing of huge datasets. Companies such as Netflix, which uses AWS for streaming, have proved how cloud infrastructure can serve large, data-intensive applications.

- **Emergence of AI and ML Services:** Cloud providers began to include artificial intelligence (AI) and machine learning (ML) capabilities into their platforms. For example, AWS, Google Cloud, and Azure introduced AI and machine learning services, allowing businesses to harness advanced analytics and automation without the need for specialised hardware.

6. Current Trends and Innovations (2020s)

- **Edge Computing:** As the demand for faster processing and lower latency developed, edge computing gained popularity. Edge computing reduces the need for centralised data centres by processing data closer to its source. Many cloud providers now provide edge services to serve IoT devices and applications with minimal latency.

- **Serverless Computing:** Serverless computing, in which developers may execute apps without managing infrastructure, has gained popularity. Examples of serverless computing include AWS Lambda, Google Cloud Functions, and Azure Functions, which make deployment and scaling easier.

- **Multi-Cloud Management Solutions:** As more firms implement multi-cloud strategies, solutions for managing cloud environments across providers have evolved, allowing them to easily monitor and optimise resources.

1. Cloud storage allows users to access their files only from one specific device. (True or False)

10.2.3 Cloud Service Models

Three service models divide cloud services: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). Each of these service models provides varying degrees of abstraction and control, catering to distinct demands and use cases.

1. Infrastructure as a Service (IaaS): IaaS provides virtualised computer resources via the internet. This covers servers, storage, networking, and other key IT tools. These tools can be hired pay-as--you-go and tailored to fit your particular requirements.

Key features:

- Scalability: As a result of scalability, resources may be easily increased or decreased in response to demand.
- By paying only for the resources that you actually use, cost efficiency allows you to reduce your capital expenditures.
- Flexibility: You can run any software, including custom apps and operating systems.

Examples:

- Amazon Web Services (AWS) EC2: Elastic Compute Cloud offers scalable computing capacity.
- Microsoft Azure Virtual Machines provide on-demand, scalable computing resources.
- Google Cloud Compute Engine provides virtual machines hosted in Google's data centres.

Use Cases:

- Hosting webpages and applications
- Data protection, backup, and recovery
- High-performance computing workloads
- Development and testing environments

2. Platform as a Service (PaaS): PaaS is a platform that allows developers to create, test, and deploy applications without the need to manage infrastructure. It covers development tools, databases, middleware, and other services required to run the entire application lifecycle.

Key features:

- Development tools include IDEs, databases, and middleware.
- Application Management Tools are used to deploy, manage, and scale applications.
- Automatic updates: The provider handles regular updates and maintenance.

Examples:

- Google App Engine is a fully managed serverless platform for creating and delivering applications.
- Microsoft Azure App Service lets developers build and host web applications, mobile app backends, and RESTful APIs.
- Heroku is a cloud platform that allows developers to construct, execute, and administer applications entirely in the cloud.

Use Cases:

- Developing and deploying web applications.
- Building and managing APIs.
- Real-time collaboration tools.
- Business analytics and intelligence applications.

3. Software as a Service (SaaS): Software as a Service (SaaS) delivers software applications over the internet through a subscription model. Users can access these programs using a web browser, thereby obviating the necessity for installation, maintenance, and local hardware.

Key features:

- Accessibility: Applications can be accessed from any internet-connected device.
- Maintenance-Free: The supplier handles all upgrades, maintenance, and security.
- Subscription-based: Users usually pay a monthly or annual subscription fee.

Examples:

- Google Workspace is a suite of productivity applications that includes Gmail, Docs, and Drive.
- Microsoft 365 is a set of cloud-based productivity and collaboration applications, including Word, Excel, and Teams.
- Salesforce is a cloud-based CRM platform that enables sales, service, and marketing automation.

Use Cases:

- Electronic mail and collaborative platforms.

- Customer Relationship Management (CRM) systems.
- Enterprise Resource Planning (ERP) systems.
  - Human resource management software.

10.4 Cloud Deployment Models

Cloud deployment models delineate the methods by which users access cloud services and administer resources. Comprehending these models is essential for identifying the optimal cloud strategy for a company's requirements. The primary cloud deployment models are public, private, and hybrid.

1. Public Cloud

Public cloud services are delivered over the internet and shared across multiple organizations. Third-party vendors, who own and manage the infrastructure, provide these services. infrastructure. Users access these services on a pay-as-you-go basis.

Key Features:

- **Scalability:** Public clouds offer vast scalability to handle varying workloads.
- **Cost Efficiency:** No need for investment in physical infrastructure; users pay only for what they use.
- **Accessibility:** Services are available from any location with internet connectivity.

Examples:

- Amazon Web Services (AWS) provides an extensive array of cloud services encompassing computation, storage, and databases.
- Microsoft Azure offers an extensive array of cloud services to address diverse business requirements.
- Google Cloud Platform (GCP) provides services including computing, storage, and machine learning.

Use Cases:

- Hosting websites and applications
- Data storage, backup, and disaster recovery
- Development and testing environments

2. Private Cloud

Individual organisations tailor private cloud services to their needs. Either on-premises or a third-party service can host the infrastructure. Private clouds provide greater control, security, and customisation than public clouds.

Key Features:

- **Control:** Organisations have full control over the cloud environment and its resources.
- **Security:** Enhanced security measures and compliance with industry standards**.**
- **Customisation:** Tailored to meet the specific needs and requirements of the organisation.

Examples:

- **VMware Private Cloud:** Provides a private cloud solution with virtualisation and management capabilities.
- **Microsoft Azure Stack:** Extends Azure services to an organisation's own data centre.

Use Cases:

- Sensitive data storage and processing
- Highly regulated industries such as finance and healthcare
- Custom business applications requiring specific configurations

3. Hybrid Cloud

Hybrid cloud amalgamates elements of both public and private clouds, enabling the exchange of data and applications between the two. This architecture offers enhanced flexibility and allows organisations to optimise their current infrastructure while utilising the scalability of public cloud services.

Key Characteristics:

- **Flexibility:** Organisations can move workloads between public and private clouds based on demand and cost-effectiveness.
- **Interoperability:** Seamless integration between on-premises infrastructure and public cloud services.
- **Optimisation:** Optimise costs and performance by using the most appropriate environment for each workload.

Examples:

- **Microsoft Azure Hybrid Cloud:** Combines on-premises and Azure public cloud resources.
- **AWS Outposts:** Extends AWS infrastructure and services to virtually any data centre.

Use Cases:

- Disaster recovery and backup solutions
- Seasonal or fluctuating workloads

- Running legacy applications alongside modern cloud services

Now that you know the different deployment models of cloud services, choosing the right model for a particular workload might be a tricky task. Selecting the appropriate cloud deployment model depends on various factors such as business requirements, budget, security needs, and regulatory compliance. Here are some considerations:

- **Public Cloud:** Ideal for organisations seeking economical, scalable solutions with reduced management requirements.
- **Private Cloud**: Optimal for organisations with rigorous security and compliance mandates or those requiring tailored infrastructure.
- **Hybrid Cloud**: Optimal for organisations requiring a combination of public and private cloud advantages, facilitating flexibility and optimisation.

10.2.5 Common Cloud Services and Tools

- **Vritual Machines:** Virtual Machines (VMs) offer virtualised computing resources that replicate physical computers. They improve efficiency and adaptability by letting users run several operating systems and applications on one physical server. The cloud provider's interface administers virtual machines, enabling users to effortlessly initiate, configure, and oversee their instances according to their requirements. This entails choosing the preferred operating system, assigning resources like CPU and RAM, and setting up network configurations. Virtual machines are exceptionally scalable, enabling users to promptly modify resources to accommodate fluctuating demands. Website and application hosting, development and testing environments, and high-performance computing workloads extensively use virtual machines. Instances of virtual machine services comprise AWS EC2, Azure Virtual Machines, and Google Compute Engine.
- **Object Storage:** Its purpose is to handle large volumes of unstructured data, such as papers, photos, movies, and backups. For the management of large volumes of data, it is quite scalable and efficient since it treats data as objects with individual identification and metadata. Applications requiring high availability and durability will find object storage perfect since it automatically replics data across several sites to provide dependability and redundancy. Simple web interfaces or APIs let users readily save and access data objects. Object storage finds common usage in disaster recovery, data archiving, and content delivery. Among object storage providers are AWS S3—Simple Storage Service, Azure Blob Storage, and Google Cloud Storage.

- **File storage:** File storage offers a shared, centralised file system open to several users and applications. It serves various purposes such as home directories, media processing, and content management systems, which necessitate file-level access and sharing. File locking, snapshots, and tiering—features of file storage systems help to maximise performance and effectively control data. Mounting file shares to their virtual machines, users can access the kept files as though they were on a local drive. Highly scalable file storage systems supported by popular file protocols, including NFS and SMB File storage products include Google Cloud Filestore, Azure Files, and AWS EFS (Elastic File System).
- **Virtual networks**: Virtual networks let users build isolated network environments inside the cloud, therefore enabling safe network traffic management. These networks build complex network architectures, including subnets, routing tables, and gateways. Virtual networks enable load balancing, VPN connections, and peering across different networks, among other networking functions. Firewalls and network security groups let users manage inbound and outgoing traffic, therefore guaranteeing that only authorised traffic may access their resources. Virtual networks can let consumers create a hybrid cloud environment by tying their on-site data centres to the cloud. Among virtual network services are Google VPC (Virtual Private Cloud), Azure Virtual Network, and AWS VPC (Virtual Private Cloud).

10.2.6 Cloud Security

Cloud security is very essential in the digital environment of today, when data breaches and cyber-attacks are ever more sophisticated and common. Strong security policies when businesses migrate their data and programs to the cloud help to maintain consumer trust and protect private data. Cloud security is a collection of rules, tools, and techniques aimed to guard data, infrastructure, and applications located in the cloud against unlawful access, data breaches, and other security risks. Regulatory standard compliance as well as protection of intellectual property and consumer data depend on it.

Common Security Practices and Tools
- Identity and Access Management (IAM): Manage user permissions and access to resources.
- Encryption: Encrypt data at rest and in transit to protect it from unauthorised access.
- Firewalls and Security Groups: Configure firewalls and security groups to control inbound and outbound traffic.

- Monitoring and Logging: Implement tracking and logging to detect and respond to security incidents.

10.7 Let Us Sum Up

In this Unit, we have seen how cloud computing has transformed individuals and organisations to manage, store, and process data by providing on-demand access to computing resources via the internet. Cloud computing, in contrast to traditional computing, enables users to access data and applications from any location with an internet connection, fostering flexibility and collaboration. This approach removes the necessity for physical servers and intricate infrastructure, enabling users to access advanced computing capabilities on a pay-per-use basis.

Several key models organise cloud services: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). Each model provides different levels of control, flexibility, and ease of use to cater to varying user needs. Public, private, and hybrid cloud deployment models further dictate the management and access of resources. Public clouds offer scalable resources accessible over the internet, while private clouds provide greater control within a dedicated environment. Hybrid clouds combine both, allowing flexibility for organisations to manage workloads across on-premises and cloud environments.

Leading providers like Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform offer extensive cloud services, catering to a wide range of industries and applications. These providers support everything from data storage and machine learning to application deployment and networking. As cloud adoption continues to grow, security remains a crucial focus, with providers and users implementing measures like encryption, identity management, and threat monitoring to ensure data protection and compliance.

In summary, cloud computing enables cost-effective, scalable, and secure access to computing resources, driving innovation across sectors and making technology accessible to organisations and individuals alike.

10.3 Learning Outcomes

Now that you have completed the Unit, you can:
- Define cloud computing and explain its basic concepts.
- Describe the different types of cloud computing services (IaaS, PaaS, SaaS).
- Explain the various cloud deployment models (public, private, hybrid, and multi-cloud).

- Identify major cloud service providers such as AWS, Microsoft Azure, Google Cloud Platform, and their core offerings.
- Discuss the benefits of cloud computing, including scalability, flexibility, cost-efficiency, and disaster recovery.
- Identify common challenges and risks associated with cloud computing, such as security, privacy, and data management.
- Identify best practices for securing cloud environments, including access control, encryption, and regular audits.

10.4 Glossary

- **Cloud Computing:** A technology that allows users to store, process, and access data and applications over the internet instead of on local devices.
- **Public Cloud:** A deployment model where cloud services are hosted by third-party providers and made available to the general public over the internet.
- **Scalability:** The ability of a computer process to be used or created in a variety of capacities.
- **Use Case:** A detailed description of how consumers engage with a system or product to achieve a goal.
- **Deployment Model:** A model that specifies how the resources of a system are used to carry out application operations.

10.5 Sample Questions

10.5.1 Objective Questions

1. One of the key benefits of cloud computing is _____, which allows resources to be adjusted up or down based on demand. *(Answer: scalability)*
2. Cloud computing enables users to access and manage data and applications over the _____ rather than on local devices. *(Answer: internet)*
3. _____ is a cloud service model that provides virtual servers, storage, and networking over the internet, allowing users to control the infrastructure. *(Answer: Infrastructure as a Service (IaaS))*

4. In a _____ cloud model, cloud services are hosted by third-party providers and made available to anyone over the internet. *(Answer: Public)*

5. A primary security measure in cloud computing is _____, which protects data by converting it into a secure format both in transit and at rest. *(Answer: encryption)*

6. Which of the following is an example of a public cloud service?

   a) Microsoft Azure

   b) VMware Private Cloud

   c) On-premises data centers

   d) Internal corporate cloud network

7. Which cloud service model provides a platform for developers to build and deploy applications without managing infrastructure?

   a) Software as a Service (SaaS)

   b) Infrastructure as a Service (IaaS)

   c) Platform as a Service (PaaS)

   d) Virtual Machines as a Service (VMaaS)

8. Which of the following is a use case for Object Storage in cloud computing?

   a) Running virtual machines

   b) Storing large amounts of unstructured data

   c) Hosting web applications

   d) Managing enterprise databases

9. What is a key benefit of hybrid cloud deployment?

   a) Exclusive reliance on on-premises infrastructure

   b) Complete elimination of security concerns

   c) Flexibility to use both public and private cloud resources

   d) It requires no management or monitoring

10. Which company launched the first major Infrastructure as a Service (IaaS) offering?

    a) Microsoft

    b) Google

    c) Amazon

    d) IBM

10.5.2 Short Answer Questions

1. Explain the concept of cloud computing and how it differs from traditional computing.
2. List and briefly explain three key characteristics of cloud computing.
3. Describe the cloud service models: IaaS, and provide one example.
4. What are the advantages of using a hybrid cloud model for organisations?
5. How does cloud computing support scalability, and why is this beneficial for businesses?
6. What is a public cloud, and in what scenarios is it most beneficial to use this model?
7. Define "Platform as a Service" (PaaS) and discuss its main benefits for developers.
8. Explain the role of virtualisation in cloud computing and how it enhances resource management.
9. What is cloud storage, and how does it improve accessibility and data management?
10. Describe two common security practices in cloud computing and their importance.

10.5.3 Long Answer Questions

1. Discuss the evolution of cloud computing. Explain how each milestone contributed to the development of modern cloud technology.
2. Describe the different cloud deployment models: public, private, and hybrid clouds. Compare their features, advantages, and limitations, and provide examples of scenarios where each model is best suited.

10.6 Suggested Learning Resources

Buyya, Rajukumar. *Cloud Computing: Principles and Paradigms.* John Wiley & Sons, 2010.

Wilkins, Mark. *Learning Amazon Web Services (AWS): A Hands-On Guide to the Fundamentals of AWS Cloud.* Pearson Education, 2019.

Unit-11: Collaborative Tools

Structure

11.0 Introduction

In today's fast-paced work environment, collaborative tools have become crucial for teams looking to work efficiently and stay connected. With more people working remotely or in hybrid setups, having reliable digital platforms that support teamwork is more important than ever. This Unit explores the world of collaborative tools, explaining why they are important, what types exist, and how they can change the way teams work together. The digital age has dramatically changed how we collaborate. Gone are the days when teamwork depended solely on being in the same room and talking face-to-face. Now, advanced technology allows us to interact and work together in real-time, no matter where we are. Collaborative tools are at the heart of this change, offering features that help us stay connected, productive, and creative. These tools include everything from project management software that keeps tasks organised to communication platforms that make it easy to stay in touch across distances. One of the biggest advantages of collaborative tools is improved communication. In traditional offices, quick conversations and meetings happened all the time. In virtual settings, we need technology to keep that spontaneous interaction alive. Tools like Slack and Microsoft Teams have changed how we communicate by offering instant messaging, video calls, and file sharing all in

one place. These platforms not only mimic face-to-face interactions but also provide useful features like searchable message histories and integration with other work apps.

However, using collaborative tools effectively can be challenging. Issues like too many tools, security concerns, and the learning curve of new technologies can be obstacles. It's important for organisations to choose the right tools that fit their needs and to provide training and support for smooth integration. This Unit aims to give a clear understanding of collaborative tools and how to use them effectively. We will look at different types of tools, their features, and best practices for using them. By the end of this Unit, readers will know how to select and use collaborative tools to create a more connected, efficient, and innovative work environment.

11.1 Objectives

After completing this Unit, you will be able to:

- Explain the importance of collaboration in academic and professional settings.
- Distinguish between different types of collaborative tools available.
- Use collaboration tools effectively for group projects and discussions.
- Develop skills in virtual teamwork and communication.

11.2 Collaborative Tools

11.2.1 Importance of Collaboration

Collaboration happens when several people work together to achieve a common goal. Collaboration in the workplace entails more than just delegating tasks or assigning work to coworkers; it is a more organised and flexible strategy that necessitates involvement, communication, debate, idea sharing, feedback, and other factors. When done correctly, workplace cooperation unifies and inspires team members toward a productive and shared vision for the firm. Collaboration in the workplace occurs regularly across multiple departments and goals. Collaborating with freelance writers, writing blog entries, and department heads defining quarterly budgets are all examples of company collaboration.

Steve Jobs said, "Great things in business are never done by one person; they're done by a team of people." Effective teamwork often serves as the foundation of business success. This phrase has never been more relevant than in today's global marketplace. If you want to manage one of the

most profitable companies in your sector, market, or even town, you will require support. A group of dedicated individuals working toward a common objective can achieve more than a single person. Working well in teams involves information sharing and effective communication, which boosts productivity, leads to better decision-making, and encourages positive employee connections.

11.2.2 Types of Collaborative Tools

There are numerous collaborative tools that can be used for seamless communication, efficient collaboration, and effective teamwork in any organization. Let us discuss them in detail.

Communication Tools

Communication tools are those tools that provide facilitation for interacting among organisation members, whether they are in the same space or located in different countries across the globe. Today, we have instant messaging platforms like Slack, Microsoft Teams, and WhatsApp that enable real-time prompt communication. They also allow for instant queries, updates, and discussions. There are many video conferencing tools, such as Zoom, Google Meet, and Microsoft Teams, that allow face-to-face synchronous meetings through video calls, fostering a more effective connection and productive collaboration. Email remains a cornerstone of both formal and informal communication, with platforms like Gmail and Outlook providing comprehensive email services along with calendars and contact management.

Project Management Tools

Project management tools are solutions intended to help teams plan, execute, and track their work more effectively. Trello, Asana, and Monday.com are task management applications that organise and track tasks, making it easy to understand what has to be done, who is responsible, and when deadlines are coming. Time-tracking software like Toggl and Harvest track how much time is spent on different tasks and projects, providing insights into productivity and ensuring that time is allocated efficiently. These technologies help to streamline project procedures and increase team accountability.

Document Collaboration Tools

Document collaboration tools enable team members to work together on documents and files effortlessly. File sharing technologies like Google Drive, Dropbox, and OneDrive allow team members to store, share, and access files from anywhere, facilitating seamless collaboration and ensuring that all must have the most up-to-date versions. There are many document editing tools, such as Google Docs, Microsoft Office 365, and Zoho Docs, that allow multiple users to edit the same

document simultaneously and also provide real-time updates and comments, resulting in enhanced collaborative writing and editing processes.

Knowledge Management Tools

Knowledge management tools help organisations search, find, store, and share knowledge bases effectively. Wikis, such as Confluence, Notion, and MediaWiki, are platforms where users can create and edit interlinked web pages, making it easy to build a comprehensive knowledge base that can be accessed by all team members. Databases like Airtable and Notion store and manage data, allowing teams to organise information in a structured manner that is easy to retrieve and update. These tools are invaluable for maintaining a storehouse of institutional knowledge and ensuring that information is accessible and readily available.

Collaboration Software Suites

Collaboration software suites combine multiple technologies into a single platform, offering a comprehensive solution for team collaboration. Microsoft 365, Google Workspace, and Zoho One are all-in-one suites that include communication, document collaboration, and project management capabilities. These integrated suites boost productivity by offering a consistent user experience, eliminating the need to switch between apps, and assuring tool interoperability and synchronization. This all-in-one method streamlines communication and increases efficiency.

Design Collaboration Tools

Design collaboration tools are specifically designed for creative teams working on visual and interactive material. Graphic design tools such as Figma, Adobe XD, and Canva enable designers to collaborate in real-time, share feedback, and modify swiftly. Prototyping technologies like InVision and Marvel App make it easier to construct interactive prototypes, allowing designers to collaborate on creating and testing user interfaces and experiences. These tools are critical to ensuring a smooth and effective design process.

Development Collaboration Tools

Development collaboration tools are made for software development teams, assisting them manage and streamline their workflows. Version control technologies like GitHub, GitLab, and Bitbucket manage changes to source code over time, enabling multiple team members to work on the same project without any conflict and providing a history of modifications made. Continuous Integration/Continuous Deployment (CI/CD) technologies such as Jenkins, Travis CI, and CircleCI automate the software deployment procedure, ensuring that code changes are tested and disposed of

efficiently. These tools enhance collaboration among teams of developers and improve the overall software development lifecycle.

Social Collaboration Tools

Social collaboration tools, similar to social networks, encourage interaction and information sharing within organizations. Platforms like Yammer, Workplace by Facebook, and Jive let employees post updates, share information, and participate in discussions. This helps create a more connected and engaged workforce. These tools also support the formation of groups and communities, promoting collaboration across departments and projects, and fostering a strong organisational culture.

Survey and Polling Tools

Survey and polling tools are important for getting feedback from team members or stakeholders. Tools like SurveyMonkey, Google Forms, and Typeform make it easy to create surveys and polls, collect responses, and analyse the data. They help in decision-making by providing a structured way to gather input on different topics, check team satisfaction, and find areas to improve. Using these tools helps organisations make better decisions and promote continuous improvement.

Check your progress:

1. Tools like Google Docs allow multiple users to _____ documents simultaneously.

11.2.3 Using Collaborative Tools Effectively

Collaborative tools help improve teamwork and communication in school and work settings. For senior secondary students, learning to use these tools well can make group projects and assignments easier and more productive.

- **Choosing the Right Tool:** Picking the right tool for your task is important. For example, Google Docs lets multiple students work on a document at the same time, which is ideal for writing papers together. For managing projects, tools like Trello or Asana let you assign tasks, set deadlines, and track progress. Knowing what your project needs will help you choose the best tool.

- **Communication and Collaboration:** Good communication tools can boost collaboration. Slack or Microsoft Teams allow you to create channels for different subjects or projects, keeping discussions organized. For instance, having a dedicated channel for biology project

means all the information and updates are in one place, making it easy for everyone to stay informed.

- **Organising Information:** Organising information well is key. Tools like OneNote or Evernote can be used to gather and arrange notes, resources, and research. For a group history project, sharing a OneNote notebook means everyone can contribute different sections, like timelines and biographies, all in one spot.

- **Regular Updates and Feedback:** Giving regular updates and asking for feedback is important to keep things moving and ensure quality. Google Forms or Typeform can be used to collect feedback from group members or teachers. For example, after finishing a draft of a report, a quick survey can help identify what needs improvement based on peer input.

- **Time Management:** Managing time is crucial. Calendar apps like Google Calendar or Microsoft Outlook help schedule meetings, set deadlines, and send reminders. Regular check-ins scheduled with Google Calendar make sure all team members know when meetings are and what deadlines are coming up, keeping the project on track.

- **Encouraging Participation:** Getting everyone to participate is vital. Tools like Padlet or Jamboard allow everyone to share ideas. During a brainstorming session for a literature project, Padlet can act as a virtual board where students post and build on each other's ideas, creating a collaborative atmosphere.

- **Monitoring Progress:** Keeping track of progress ensures everyone is contributing. Project management tools like Monday.com or Basecamp let you track tasks and assign responsibilities. For a computer science project, using Monday.com to list tasks and assign them to team members helps ensure everything gets done on time.

- **Continuous Learning and Adaptation:** Learning and adapting continuously is important. As students use these tools more, they should reflect on what worked and what didn't and adjust their approach. After completing a project, a debrief session using tools like Zoom can help the team discuss what they learnt and how to improve next time.

By using collaborative tools effectively, team members can improve their teamwork, get better project results, and prepare for future academic and professional challenges.

11.2.4 Best Practices for Virtual Teamwork

- **Clear Communication:** Good communication is crucial for virtual teams. Use various tools like email, chat apps such as Slack, and video calls on Zoom to keep everyone informed. For example, daily Zoom meetings can help team members stay updated on tasks and challenges.

Collaborative tools like Google Docs or Microsoft Teams let everyone work on the same document at the same time, making sure everyone is on the same page.

- **Defined Roles and Responsibilities:** In virtual teams, everyone needs to know their specific tasks to avoid confusion. Use project management tools like Trello or Asana to clearly outline each person's responsibilities. For instance, in a marketing team, one person might handle content creation, another social media, and another analytics, all clearly marked in the project plan.

- **Regular Check-Ins:** Regular check-ins keep the team aligned and motivated. Weekly or biweekly video calls can help address issues early and ensure progress towards goals. For example, a team might meet on a Monday to set weekly priorities and another on Friday to review achievements and plan for the next week.

- **Use of Technology:** Using the right technology helps virtual teams work smoothly. Tools like Jira or Basecamp for project management and Miro for brainstorming sessions make organising work easier. For example, Miro allows team members to brainstorm and map out ideas visually, similar to using a whiteboard in an office.

- **Building Trust and Relationships:** Building trust in a virtual team is key for successful collaboration. Encourage team members to share personal updates and have informal chats, like virtual coffee breaks or team-building activities. For instance, a monthly virtual joyful hour can help team members bond and build trust.

- **Setting Clear Goals and Expectations:** Clear goals and expectations give virtual teams direction. Set specific, measurable, achievable, relevant, and time-bound (SMART) goals so everyone knows what to aim for. For example, a software team might aim to release a new feature by the end of the quarter, with milestones and deadlines in their project management tool.

- **Encouraging Flexibility and Understanding:** Flexibility and understanding are important in virtual teams as team members might be in different time zones and have various personal commitments. Allowing flexible work hours and showing empathy can boost productivity and satisfaction. For example, let team members choose their working hours as long as they meet deadlines and attend key meetings.

- **Promoting Accountability:** This ensures everyone does their part. Use performance tracking tools and regularly review progress to maintain accountability. For example, a sales team

might use a CRM system to track sales performance, with regular updates in team meetings to ensure targets are met.

● **Fostering a Positive Team Culture:** A positive team culture improves morale and productivity. Encourage positive feedback, celebrate successes, and recognise individual contributions. For instance, having a recognition program where team members acknowledge each other's efforts can boost team spirit.

● **Providing Training and Development Opportunities:** Ongoing learning and development are important for virtual teams. Offer training sessions and encourage professional growth to improve skills. For example, a company might provide online courses or webinars on new technologies to keep the team up-to-date.

By following these practices, virtual teams can overcome remote work challenges and achieve high levels of collaboration, productivity, and job satisfaction.

11.2.5 Let Us Sum Up

To sum up, we can conclude that collaborative tools are essential in today's fast-paced and remote work settings. They help teams communicate better, manage projects more efficiently, and create a more inclusive work culture. Tools like Slack, Microsoft Teams, Trello, and Asana offer different features to suit various needs. Using these tools effectively improves daily work and helps with long-term planning. However, challenges such as too many tools, security issues, and learning how to use new technology need to be addressed. By choosing the right tools, providing proper training, and encouraging their use, teams can overcome these challenges and make the most of their capabilities. Collaborative tools are more than just technology—they help create a connected, efficient, and innovative workplace, setting the stage for future success.

11.3 Learning Outcomes

After completing this Unit, learners should be able to::

● Explain the importance of collaboration in academic and professional settings.
● Distinguish between different types of collaborative tools available.
● Use collaboration tools effectively for group projects and discussions.
● Develop skills in virtual teamwork and communication.

11.4 Glossary

- **Collaborative Tools:** Collaborative tools are digital programs and apps that help teams work together and communicate.

- **Project Management Software:** Project management software helps teams plan and organise their work. It allows them to set deadlines, assign tasks, track progress, and communicate with each other.

- **Communication Platforms:** Communication platforms are tools that help teams talk to each other. They include features like instant messaging, video calls, and sharing files.

- **Task Management:** Tools or software applications that help teams organise, track, and manage their tasks and projects effectively.

- **Time Tracking:** Software used to monitor and record the time spent on tasks and projects, providing insights into productivity and time management.

- **Wikis:** Platforms that allow collaborative creation and editing of interlinked web pages, used for building comprehensive knowledge bases.

- **Databases:** Systems that store and manage structured sets of data, enabling easy retrieval, updating, and organisation of information.

- **Prototyping:** Tools or software used to create interactive prototypes of designs or applications, facilitating collaboration and testing of user interfaces and experiences.

- **Flexibility:** The ability to adapt and adjust schedules, tasks, and working conditions to accommodate varying needs, such as different time zones or personal commitments.

- **Accountability:** Taking responsibility for one's actions and delivering on commitments within a team. Accountability ensures that tasks are completed and goals are achieved.

11.5 Sample Questions

11.5.1 Objective Questions

1. What is the primary purpose of collaboration in the workplace?

  a) Assigning work to employees

  b) Delegating tasks only

  c) Encouraging teamwork, communication, and idea sharing

  d) Reducing employee workload

213

2. Which of the following is an example of a communication tool used for real-time messaging?

a) Google Docs

b) Slack

c) Trello

d) Dropbox

3. What is the main function of project management tools?

a) Editing and sharing documents

b) Managing and tracking tasks efficiently

c) Conducting virtual meetings

d) Storing and retrieving knowledge bases

4. Which of the following is NOT a document collaboration tool?

a) Google Docs

b) Microsoft Office 365

c) Zoom

d) Zoho Docs

5. What is the role of version control tools like GitHub in development collaboration?

a) Tracking changes to source code

b) Conducting video conferences

c) Managing social media content

d) Scheduling meetings

6. Which tool is specifically designed to help teams organize and track their work progress?

a) WhatsApp

b) Asana

c) Google Forms

d) Canva

7. What type of tool is Google Forms primarily used as?

a) Communication tool

b) Survey and polling tool

c) Project management tool

d) Design collaboration tool

8. Which of the following is a best practice for virtual teamwork?

a) Assigning tasks without clear deadlines

b) Encouraging flexibility and understanding

c) Avoiding check-ins to reduce meetings

d) Relying only on emails for communication

9. What is an example of a social collaboration tool?

a) Google Drive

b) Yammer

c) Trello

d) Microsoft Outlook

10. Why is fostering a positive team culture important in virtual teams?

a) It ensures employees work overtime

b) It improves morale and productivity

c) It replaces the need for clear goals

d) It eliminates the need for regular updates

11.5.2 Short Answer Questions

1. Explain the significance of collaborative tools in the modern workplace and how they have changed traditional methods of teamwork.

2. Discuss the benefits and challenges of using project management tools like Trello and Asana. How do they improve team accountability and productivity?

3. Describe how knowledge management tools such as Confluence and Notion help organisations maintain and share institutional knowledge. Provide examples of their use.

4. How do design collaboration tools like Figma and Adobe XD facilitate the design process for creative teams?

5. Compare and contrast document collaboration tools like Google Docs and Microsoft Office 365.

11.5.3 Long Answer Questions

1. How do social collaboration tools like Yammer and Workplace by Facebook create a more connected and engaged workforce? Discuss their impact on organisational culture and inter-departmental collaboration.

2. Reflect on Steve Jobs' quote, "Great things in business are never done by one person; they're done by a team of people." How does this perspective align with the use of collaborative tools in achieving business success?

3. Explain how choosing the right collaborative tool can improve the efficiency and productivity of group projects. Provide examples of tools and their specific uses.
4. Discuss the importance of regular updates and feedback in collaborative projects. How can tools like Google Forms or Typeform facilitate this process?
5. Describe best practices for clear communication in virtual teams. How do tools like Slack, Zoom, and Google Docs contribute to effective communication and collaboration?

11.6 Suggested Learning Resources

Blokdyk, Gerardus. *Collaboration Tools: A Complete Guide - 2020 Edition*. 5STARCooks, 2020.

Chagour, David. *Microsoft Teams Essential How-Tos.* Independently Published, 2020.

Orel, Markus. *Collaboration Potential in Virtual Reality (VR) Office Space: Transforming the Workplace of Tomorrow*. Springer, 2022.

Razzetti, Gustavo. *Remote, Not Distant: Design a Company Culture That Will Help You Thrive in a Hybrid Workplace.* Liberationist Press, 2022.

Wheeler, Christina, and Joao Ferreira Lopez. *Mastering Microsoft Teams: End User Guide to Practical Usage, Collaboration, and Governance.* Packt Publishing, 2020.

Unit-12: Online Forms and Surveys

Structure

12.0 Introduction

Since we live in the digital age, technology has changed how we find knowledge. The creation of online polls is one of the most important improvements. The way businesses, researchers, and groups gather data has changed a lot because of these tools. This part goes into great detail about online surveys, including their benefits, how they should be designed, and the moral issues they raise.

12.1 Objectives

On completion of this Unit, you will be able to:

- Explain the basics of online forms and surveys.
- Identify different types of online forms and surveys.
- Create basic online forms and surveys.
- Apply Question design best practices.

- Analyze and interpret survey responses.
- Evaluate the effectiveness of online forms and surveys.

12.2 Online Forms/ Surveys

12.2.1 The Evolution of Surveys

For many years, surveys have been an important way to gather information. Paper forms, phone talks, or face-to-face meetings were traditionally used to do them. However, these ways often needed a lot of time and money. There was a big change when the internet came along. Online polls are faster, cheaper, and more flexible than other methods, and they can collect information from a large group of people quickly. You can use Google Forms, Microsoft Forms, SurveryMonkey, etc. for this purpose.

Advantages

- Cost-effectiveness: One of the best things about online polls is that they don't cost much. There are no costs for printing, mailing, or interviewers like there are with traditional means. A lot of online survey tools are free or have low-cost plans that make them simple for people and small businesses to use.
- Speed and Reach: Online polls can be sent to a lot of people fast. Researchers can get in touch with people all over the world with just a few clicks. This speed not only speeds up the gathering of data, but it also lets research and decisions be made quickly.
- Convenience for Respondents: People can fill out surveys on their own time and on a variety of devices, like computers, tablets, and smart phones. This kind of flexibility often leads to more answers that are well thought out.
- Accuracy of Data and Ease of Analysis: Online polls make it less likely that people will make mistakes when entering data. Responses are saved instantly and can be easily sent to software for analysis, which makes the analysis more accurate and faster.

12.2.2 Designing Effective Online Surveys

It takes careful planning and attention to detail to make an online poll work. These are important things to think about:

1. Clear Objectives: Make sure you know why you're making the survey before you start making it. What kind of information do you want? What choices will the numbers help you make? Setting clear goals for the poll makes sure that it stays on track and is useful.

2. Question Design: Questions should be easy to understand, short, and fair. Do not ask leading questions that could change people's answers. To get a wide range of information, ask a variety of question types, such as multiple-choice, Likert scale, and open-ended.

3. Logical Flow: The questions in the survey should be put in a way that makes sense, so the answers should make sense. Put questions that are linked together and use skip logic to help people get to the right parts of the form based on their answers.

4. Testing: Test your survey with a small group of people to see if there are any issues with how clear the questions are, how long the survey is, or any technology issues. Use what they say to improve the poll before you send it out to everyone.

5. Accessibility: Make sure that everyone who wants to fill out the poll can do so, even people with disabilities. This means using fonts that are easy to read, giving text alternatives for pictures, and making sure that the site works with screen readers.

Promotion and distribution of surveys:

To get a good response rate, you need to make sure that your online poll is widely shared and promoted. Look at these strategies:

- Email Invitations: Email is still a fantastic way to send out surveys. Make unique and interesting email invitations that make it clear what the survey is for, how long it should take, and how important it is for people to fill it out. If you need to, send messages afterward.

- Social Media: Use social networking sites to get your message to more people. Post the survey link on the profiles of your company, in relevant groups, and on forums. Tell people who follow you to share the poll with their friends and family.

- Incentives: Giving incentives, like a chance to win a prize, discount codes, or small amounts of money, can get a lot more people to join. Make sure that the incentives are fair and don't affect the answers in any way.

- Website Integration: Put the poll link on your website or use pop-ups to get people to fill it out. This works especially well for polls that are aimed at customers or website visitors.

Check your progress:

1. Google Forms is an example of an _____ platform for creating surveys. (Online/Offline)?

219

12.2.3 Publication Ethics

When you perform online surveys, you need to think about a few ethical issues to keep the data and users safe:

- Informed Consent: Make sure that people who fill out the survey know why it's being done, how their information will be used, and that they can quit at any time. At the start of the poll, this information should be made very clear.

- Privacy and Confidentiality: Use secure poll platforms and anonymise data to protect respondents' privacy. Make it clear how you will use and store personal information.

- Avoiding Coercion: People should be able to choose to participate without being forced to. The incentives should not be excessive that they make people less likely to participate.

- Data Security: To keep your data safe from hackers and other people who shouldn't be able to see it, use strong data security measures. Using safe connections (SSL), encryption, and regular security checks are all part of this.

12.2.4 Analysis of Survey Data

After getting the data, the next step is to analyse it. These are the best ways to do things:

- Data Cleaning: Look over the data to see if there are any errors, duplicates, or answers that aren't complete. Clean up the information to make sure it is correct.

- Descriptive Statistics: To sum up the facts, start with descriptive statistics. To get a general idea of the answers, this includes finding the means, medians, and rates.

- Cross-Tabulation: Look into how different variables are related by using cross-tabulation. This can give you information about how people from different groups of people answer certain questions.

- Advanced Analytics: To do more complicated analysis, use statistical software to do advanced techniques like factor analysis, regression analysis, and more. With these methods, you can find greater trends and insights.

- Visual Representation: Use charts, graphs, and dashboards to show the info visually. It's easier to share results with partners when they can see them.

12.2.5 Case Studies

Let us look at two case studies to show how useful online polls can be:

12.2.5.1 Case Study 1: Shopping around for a New Product

An online poll was used by a tech startup to find out how many people were interested in a new wearable gadget. Through email and social media, they went after tech-savvy customers. The survey asked about how people use wearable tech now, what functions they want, and how price-sensitive they are. The data showed that people were very interested in health-tracking tools and were ready to pay more for more advanced ones. This information helped shape the product's development and marketing plan, which led to a successful launch.

Example: Online Survey Questionnaire: Market Research for a New Product

We are conducting market research to gather insights on a new wearable device we are developing. Your feedback is invaluable and will help us create a product that meets your needs and preferences. This survey will take approximately 10 minutes to complete. Your responses will be kept confidential.

Section 1: Demographics

1. Age: _____Years ?

2. Gender: *Please Tick*. (Male/Female/Third Gender/Prefer Not To Say)

3. Location: _____

4. Your Employment Status:

   - full-time

   - part-time

   - Self-employed

   - Unemployed

   - Student

   - Retired

   - Other (please specify)

Section 2: Current Device Usage

5. Do you currently own a wearable device?

   - Yes

   - No

6. If yes, which type of wearable device do you own? (Select all that apply)

   - Fitness tracker

   - Smartwatch

   - Smart glasses

- Other (please specify)

7. How often do you use your wearable device?

- Daily

- Several times a week

- Weekly

- Monthly

- Rarely

- Never

8. What brand(s) of wearable devices do you currently own or have owned in the past? (Select all that apply)

- Apple

- Samsung

- Fitbit

- Garmin

- Huawei

- Other (please specify)

9. What features do you use most frequently on your wearable device? (Select up to 3)

- Fitness tracking (steps, calories, etc.)

- Heart rate monitoring

- Sleep tracking

- Notifications (calls, texts, emails)

- GPS and navigation

- Music control

- Contactless payments

- Other (please specify)

Section 3: Preferences and Expectations

10. What features are most important to you in a wearable device? (Select up to 3)

- Fitness tracking (steps, calories, etc.)

- Heart rate monitoring

- Sleep tracking

- Notifications (calls, texts, emails)

- GPS and navigation

- Music control

- Contactless payments

- Long battery life

- Water resistance

- Stylish design

- Other (please specify)

11. How much would you be willing to spend on a new wearable device with the features you selected above?

- Under ₹. 100

- ₹100 - Rs199

- ₹200 - ₹299

- ₹300 - ₹399

- ₹400 - ₹499

- ₹500 or more

12. Which of the following health and wellness features would you find valuable in a wearable device? (Select all that apply)

- Blood pressure monitoring

- Blood oxygen level monitoring

- Stress level tracking

- Electrocardiogram (ECG)

- Guided breathing exercises

- Fall detection

- Menstrual cycle tracking

- Skin temperature monitoring

- Other (please specify)

13. How significant is the brand of a wearable gadget to you?

- Highly significant

- Moderately significant

– Indifferent

- Slightly significant

- Insignificant

14. How likely are you to recommend a wearable device to friends or family based on your experiences?

    - Very likely

    - Likely

    - Neutral

    - Unlikely

    - Very unlikely

Section 4: Potential Product Features

15. Which of the following innovative features would you be interested in? (Select all that apply)

    - Advanced sleep analysis

    - Voice assistant integration (e.g., Alexa, Google Assistant)

    - Smart home control

    - AI-driven health insights

    - UV exposure monitoring

    - Personalized fitness coaching

    - Customizable watch faces

    - Solar charging

    - Emergency SOS feature

    - Other (please specify)

16. What would make you switch from your current wearable device to a new one? (Select up to 3)

    - Better battery life

    - More accurate health tracking

    - New and innovative features

    - Improved design and comfort

    - Better integration with other devices/apps

    - More affordable price

    - Better customer service and support

    - Other (please specify)

Section 5: Additional Feedback

17. What challenges or frustrations have you experienced with your current wearable device? (Select all that apply)

- Short battery life

- Inaccurate data tracking

- Lack of features

- Uncomfortable to wear

- Poor customer support

- Software issues

- High price

- Other (please specify)

18. Do you have any suggestions for features or improvements for our new wearable device?

Ans:

19. Would you be interested in participating in future surveys or product testing?

- Yes (please provide your email)

- No

Thank you. Your feedback matters a lot in developing good gadgets . If you have opted to participate in future surveys or product testing, we will be in touch soon.

12.2.5.2 Case Study 2: A Survey of Employee Satisfaction

A medium-sized business used an online poll to find out how happy its workers were and where they thought the business could improve. To get honest answers, the poll was anonymous. The questions were about many things related to the workplace, such as management, work-life balance, and chances for professional growth. The data showed that there needs to be more open communication and more flexible work hours. Based on the input, the company made changes that made employees happier and kept them on.

--> Employee Satisfaction Survey

--> Introduction

Thank you for participating in the survey. Your feedback is crucial in helping us understand your experiences and identify areas for improvement. All responses will be kept confidential.

Section 1: Demographics

1. Age:

- Under 22

- 22-32

- 33-43

- 44-53

- 54-63

- 64 or older

2. Gender:_____

3. Department:

4. Job Title:

5. Length of Employment:

  - Fresher

  - 1 year to 5 Years

  - 5- 10 Years

  - More than 10 years

Section 2: Job Satisfaction

6. Overall, Rate your satisfaction with your current job?

  - Excellent

  - V Good

  - Good

  - Not Bad

  - Dissatisfied

7. How effectively does your employment satisfy expectations?

  - Surpasses expectations

  - Meets expectations

  - Neutral

  - Below expectations

  - Far below expectations

8. How satisfied are you with your workload?

  - Very satisfied

  - Satisfied

  - Neutral

  - Dissatisfied

  - Very dissatisfied

9. How difficult & challenging is your job?

   - Very difficult & challenging

   - Challenging but not difficult

   - Neutral

   - Not very challenging but difficult

   - Not challenging at all

10. How satisfied are you with the tools and resources provided to do your job effectively?

   - Very satisfied

   - Satisfied

   - Neutral

   - Dissatisfied

   - Very dissatisfied

Section 3: Work Environment

11. How would you rate the physical work environment? (e.g., cleanliness, comfort, facilities)

   - Excellent

   - Good

   - Neutral

   - Poor

   - Very poor

12. How would you rate the level of communication within your team?

   - Excellent

   - Good

   - Neutral

   - Poor

   - Very poor

13. How would you rate the level of communication between different departments?

   - Excellent

   - Good

   - Neutral

   - Poor

- Very poor

14. How supportive is your immediate supervisor/manager?

   - Very supportive

   - Supportive

   - Neutral

   - Unsupportive

   - Very unsupportive

15. How valued do you feel as an employee in this organization?

   - Very valued

   - Valued

   - Neutral

   - Not very valued

   - Not valued at all

Section 4: Professional Development

16. How satisfied are you with professional development opportunities?

   - Very satisfied

   - Satisfied

   - Neutral

   - Dissatisfied

   - Very dissatisfied

17. How often do you receive feedback on your performance?

   - Regularly

   - Occasionally

   - Rarely

   - Never

18. How effective do you find the feedback you receive?

   - Very effective

   - Effective

   - Neutral

   - Ineffective

   - Very ineffective

19. Are the company's training and development programs satisfactory?

- Very satisfied

- Satisfied

- Neutral

- Dissatisfied

- Very dissatisfied

Section 5: Compensation and Benefits

20. How satisfied are you with your salary, bonuses, etc.?

- Very satisfied

- Satisfied

- Neutral

- Dissatisfied

- Very dissatisfied

21. How satisfied are you with the benefits provided (health insurance, retirement plans, etc.)?

- Very satisfied

- Satisfied

- Neutral

- Dissatisfied

- Very dissatisfied

22. How competitive do you feel your compensation is compared to similar positions in other companies?

- Very competitive

- Competitive

- Neutral

- Not very competitive

- Not competitive at all

Section 6: Work-Life Balance

23. How satisfied are you with your work-life balance?

- Very satisfied

- Satisfied

- Neutral

- Dissatisfied

- Very dissatisfied

24. How often do you feel stressed or overwhelmed by your work?

   - Always

   - Often

   - Sometimes

   - Rarely

   - Never

25. How supportive is the company of employees' work-life balance?

   - Very good

   - Good

   - Neutral

   - Bad

   - Very Bad

Section 7: Company Culture

26. How would you rate the overall company culture?

   - Excellent

   - Good

   - Neutral

   - Poor

   - Very poor

27. How well do the company's values align with your personal values?

   - Very well

   - Well

   - Neutral

   - Poorly

   - Very poorly

28. How inclusive and diverse do you find the company's work environment?

   - Very inclusive and diverse

   - Inclusive and diverse

   - Neutral

   - Not very inclusive and diverse

   - Not inclusive and diverse at all

Section 8: Additional Feedback

29. What do you enjoy most about working at this company?

_____

30. What changes or improvements would you suggest to enhance your job satisfaction?

_____

31. Any other comments or feedback?

_____

Thank you for your time and valuable insights. Your feedback is essential in helping us create a better work environment and improve employee satisfaction. If you have any concerns or wish to discuss your feedback further, please feel free to contact [HR contact information].

12.2.6 Let Us Sum Up

In this Unit, you have explored the fundamentals of online forms and surveys, learning how they are essential tools for gathering data, feedback, and insights in various contexts such as registrations, evaluations, and research.

You have learnt about the different types of online forms and surveys and their various purposes. You have also gained the skills to create simple online forms and surveys using tools like Google Forms and Microsoft Forms. Throughout the Unit, you have been guided on how to add different types of questions, such as multiple-choice, short answer, and rating scales, and how to design clear and effective questions for accurate data collection.

Additionally, you have learnt how to distribute your forms and surveys through various channels like email, social media, or embedded links to ensure they reach your target audience. You have also gained the ability to analyse the responses, interpret the data, and generate simple reports or visualisations, such as charts and graphs.

This Unit has also emphasised the importance of data privacy and ethical considerations when collecting information. You have learnt best practices for ensuring respondent confidentiality and obtaining informed consent.

By the end of this Unit, you have acquired the knowledge and skills needed to create, distribute, and analyse online forms and surveys effectively and ethically, equipping you to collect valuable data for various purposes.

12.3 Learning Outcomes

Now that you have completed the Unit, you can:

- Define online forms and surveys, explain their purposes, and understand how they are used for data collection, feedback, and decision-making in various contexts.
- Design and create simple online forms and surveys using popular tools (e.g., Google Forms, Microsoft Forms), including adding various types of questions, setting required fields, and customising the form layout.
- Share and distribute online forms and surveys through different channels (e.g., email, social media, embedded links) to reach the intended audience.
- Explain the ethical implications and privacy concerns related to collecting data through online forms and surveys and the best practices for ensuring respondent confidentiality and consent.

12.4 Glossary

- **Online Form:** A digital document that allows users to input data or information into predefined fields. It is used for various purposes, such as feedback collection, registrations, or surveys.
- **Survey:** A method of collecting information or feedback from a group of people, typically using a structured set of questions used for research, opinions, or data collection.
- **Questionnaire:** A set of questions used in surveys or forms to gather information from respondents. **Response:** The answers or data submitted by users when they complete a form or survey. Responses can be analyzed to gain insights or feedback from participants.
- **Multiple-Choice Question (MCQ):** A type of question where respondents are given a set of predefined options to choose from. It is commonly used in surveys and forms for easy data analysis.
- **Google Forms:** A free, web-based tool from Google that allows users to create, distribute, and analyse surveys and forms. It includes various features for customization, data collection, and reporting.

- **Field:** An individual input area in a form where users can enter specific information, such as text, numbers, or dates. Fields can be text boxes, checkboxes, or dropdown menus.

- **Data Privacy:** The protection of personal information collected through online forms and surveys. It involves ensuring that data is stored securely and only accessible by authorized parties.

- **Ethical Considerations:** The principles of fairness and responsibility when collecting data. This includes ensuring that respondents' privacy is respected and that they give informed consent to participate in surveys or forms.

- **Response Rate:** The percentage of respondents who complete and submit a survey or form compared to the total number of individuals invited to participate. A higher response rate often indicates better engagement and data reliability.

12.5 Sample Questions

12.5.1 Objective Questions

1. What is the primary purpose of an online form?

    a) To provide information about products

    b) **To collect data from users**

    c) To store files and documents

    d) To send messages to multiple recipients

2. Which of the following is NOT a common question type used in online surveys?

    a) Multiple-choice

    b) Short answer

    c) Essay

    d) **Feedback emoji**

3. Which tool is commonly used to create and manage online forms and surveys?

    a) Microsoft Excel

    b) **Google Forms**

    c) Microsoft Word

    d) Adobe Photoshop

4. What is the term for the answers or data submitted by users in response to a survey or form?

    a) Queries

b) Inputs

c) **Responses**

d) Fields

5. Why is data privacy important when collecting information through online forms and surveys?

a) To ensure data is shared with everyone

b) To make forms look more professional

c) To analyze the data faster

d) **To protect personal information and ensure confidentiality**

6. Which of the following is NOT an advantage of online surveys?

a) Cost-effectiveness

b) Speed and reach

c) **Limited data collection**

d) Convenience for respondents

7. Why are online surveys considered cost-effective?

a) **They do not require printing or mailing costs**

b) They require a large number of interviewers

c) They take a long time to conduct

d) They require expensive survey tools

8. What is a key ethical consideration when conducting online surveys?

a) Ensuring respondents are forced to complete the survey

b) **Keeping respondents' data confidential and secure**

c) Sharing all respondent information publicly

d) Using complex language to confuse respondents

9. Which strategy can help increase survey participation rates?

a) Keeping surveys secret and unadvertised

b) **Using email invitations and social media promotions**

c) Making surveys extremely difficult to complete

d) Avoiding incentives for participation

10. What is "cross-tabulation" used for in survey analysis?

a) To summarize the general findings of a survey

b) **To analyze the relationship between different survey variables**

c) To ensure every respondent has answered all questions

d) To create unnecessary complexity in analysis

12.5.2 Short Answer Questions

1. Explain the purpose and benefits of using online forms in data collection.
2. Describe the key features to consider when designing an effective online survey.
3. What are some common tools and platforms used to create online forms and surveys? Provide examples.
4. How can you ensure data security and privacy when collecting responses through online forms and surveys?
5. What strategies can be used to increase response rates for online surveys?

12.5.3 Long Answer Questions

1. Discuss the key components and best practices for designing effective online forms and surveys.
2. Evaluate the challenges and solutions in ensuring data privacy and security in online forms and surveys.

12.6 Suggested Learning Resources

"Create a New Survey." Google Surveys Help, *Google*, https://support.google.com/surveys/answer/2372144?hl=en. Accessed 29 Nov. 2024.

"Create a Form with Microsoft Forms." Microsoft Support, *Microsoft*, https://support.microsoft.com/en-us/office/create-a-form-with-microsoft-forms-4ffb64cc-7d5d-402f-b82e-b1d49418fd9d. Accessed 29 Nov. 2024.

Canva Survey Maker. *Canva*, https://www.canva.com/create/surveys/. Accessed 29 Nov. 2024.

Schwesinger, Borries. *The Form Book: Creating Forms for Business and Online Use.* Thames & Hudson Ltd, 2010.

Unit-13: Video Conferencing

Structure

13.0 Introduction

Video conferencing is a service enabling real-time communication. It includes features such as videoconferencing, telepresence, and online meetings. These sessions are typically organised around specific subjects/topics. Video conferencing is a technology that enables real-time communication through video and audio over the internet, transforming how we work, learn, and socialise by eliminating the need for physical presence. In business, it supports remote work, facilitating meetings, interviews, webinars, and collaborative efforts, thereby saving time and money while enhancing flexibility. In education, it makes learning accessible from anywhere, allowing students to attend live classes and teachers to offer lectures and support, including global guest speakers. In healthcare, telemedicine uses video conferencing for remote consultations, increasing accessibility, especially in remote areas, and enabling easier professional collaboration. Socially, it helps maintain personal connections, crucial during the COVID-19 pandemic, with platforms like Zoom and Skype. Technological advancements, such as high-definition video, improved audio, and

VR/AR integration, continue to enhance the experience, making video conferencing an ever-evolving tool that enriches communication across various fields.

13.1 Objectives

Up on completion of this Unit, you will be able to:
- Explain the fundamentals of videoconferencing technology.
- Explore the applications of videoconferencing in daily life.
- Analyse the impact of videoconferencing on education.
- Examine the role of videoconferencing in business communication.
- Investigate the environmental implications of videoconferencing.

13.2 Video Conferencing

13.2.1 What is Video Conferencing?

Video conferencing is a technology that lets people talk and see each other in real-time using video and audio over the internet or other networks. It has changed how we work, learn, and socialise by removing the need to be in the same place physically. In business, video conferencing is crucial for remote work, allowing teams to stay productive even if they're spread out across different locations. Companies use it for meetings, interviews, webinars, and collaborative work, saving time and money while making work more flexible. Features like screen sharing and virtual whiteboards make it easy to share ideas and documents. In education, video conferencing makes learning more accessible. Students can attend live classes from anywhere, which is especially helpful for those who can't easily get to school. Teachers use it to give lectures, lead discussions, and provide one-on-one support. It also lets schools bring in guest speakers from around the world. In healthcare, video conferencing is used in telemedicine, allowing doctors to consult with patients remotely. This makes healthcare more accessible, especially for people in remote areas. Doctors can provide real-time consultations and collaborate with other healthcare professionals more easily.

Socially, video conferencing helps friends and family stay connected, especially when they can't travel to see each other. During the COVID-19 pandemic, it became an essential tool for maintaining personal connections. Platforms like Zoom, Skype, and FaceTime allow people to see and talk to each other in real-time, adding a personal touch to conversations. Technological

improvements are making video conferencing better. High-definition video, better audio, and features like background noise cancellation enhance the experience. Virtual and augmented reality (VR/AR) are also starting to be used, making video conferencing more immersive. Therefore, video conferencing is a powerful tool that has changed how we communicate in business, education, healthcare, and personal relationships. As technology improves, it will continue to connect people in new and exciting ways.

13.2.2 How does video conferencing work?

Video conferencing lets people in different places see and talk to each other using technology. Let us see a simple explanation of how it works:

- Capturing Video and Sound using Cameras and Microphones: Each person needs a device with a camera and a microphone to capture their image and voice. These can be built into laptops, smartphones, tablets, or can be separate webcams and microphones.

- Making the Data Smaller by Compression: The video and audio data are made smaller using special methods so they can be sent quickly over the internet. This keeps the quality excellent while using less internet bandwidth.

- Sending the Data through Internet Connection: The compressed data is sent over the internet. A stable and fast internet connection is needed to avoid delays or interruptions. There are certain protocols; they are basically specific rules used to make sure the data is sent correctly. WebRTC is one common protocol for real-time video and audio.

- Making the Data Usable Again by Decompression: When the data reaches the other end, it is made larger again so it can be used. This process ensures that the video and audio are clear and in sync.

- Showing the Video and Playing the Sound through Displays and Speakers: The video appears on the screen, and the sound comes through speakers or headphones. This lets participants see and hear each other clearly.

- Interactive Features or Extra Tools: Many video conferencing tools offer features to make the experience better, such as:
  ➢ Screen sharing, which lets people show their computer screen to others.
  ➢ Virtual whiteboards allow people to draw and write on a shared digital board.
  ➢ Chat offers a text chat option alongside the video and audio.
  ➢ Recording helps people record the meeting to watch later.

- Using the Software through Platforms and Apps: People use software platforms or apps like Zoom, Skype, Microsoft Teams, or Google Meet to join and manage video calls. These platforms handle setting up the call, connecting everyone, and providing the extra features.

Therefore, by using these features and technologies, video conferencing makes it possible for people to have face-to-face conversations, no matter where they are. This makes it a useful tool for work, school, healthcare, and staying in touch with family and friends.

13.2.3 Importance of Video Conferencing

As video conferencing enables real-time conversation, it is becoming an integral part of many organisations and institutions. It became a cornerstone for several reasons. Let us discuss them briefly.

Remote Work and Collaboration: It allows people to work together from different places, which is especially useful for remote work. Today, people need not necessarily work in the confinement of offices anymore. They can work from anywhere, and video conferencing helps them connect with other colleagues and the organisation seamlessly. It saves time and money on travel and helps companies hire talented people from anywhere. Remote jobs are getting popular these days. Companies and organisations can conduct interviews online through video conferencing. Meetings and discussions can be carried out through videoconferencing. It was video conferencing that played a crucial role in running businesses and organisations during the COVID-19 pandemic.

Education and Learning: It helps students learn from anywhere, even if they can't be in a classroom. Teachers can hold classes online and bring in experts from around the world. Video conferencing is a big help in education for several reasons. It lets students and teachers connect from different places, which is ideal for remote learning. This is especially important for students in areas where excellent schools are hard to find. It also makes it easy for students to work together on group projects and attend virtual classes with students from other schools or countries. This helps them learn about different cultures and see things from new perspectives. Teachers can bring in guest speakers and experts from around the world to share their knowledge with students. This makes lessons more engaging and gives students a chance to learn beyond their textbooks.

Video conferencing also lets teachers give students personalised help. They can have one-on-one sessions, give feedback on assignments, and make sure each student gets the help they need. For teachers, video conferencing means they can keep learning too. They can go to workshops, conferences, and training sessions online, which helps them learn new ways to teach.

We can say that video conferencing in education makes learning more flexible and lets students and teachers work together even if they're far apart. It also helps students learn from experts worldwide and gives teachers new ways to teach and learn themselves.

Healthcare and Telemedicine: Video conferencing has greatly improved the medical field by making healthcare more accessible, efficient, and collaborative. Through telemedicine, patients, especially those in rural or underserved areas, can consult with doctors remotely, saving time and travel expenses. It allows for timely medical consultations, crucial in emergencies, and better management of chronic conditions through regular remote check-ups. Medical professionals can collaborate in real-time on complex cases, enhancing patient care with a multidisciplinary approach. Additionally, video conferencing supports medical training and continuing education by connecting students and professionals with experts worldwide and providing live insights into surgeries and procedures. It also aids in patient education by facilitating virtual health classes and support groups, helping patients understand their conditions and treatments better. Overall, video conferencing enhances healthcare delivery, professional collaboration, and patient support, leading to improved outcomes. Doctors can use video conferencing to talk to patients who can't come to the office. This is helpful for people who live far away or can't leave home easily.

Social Connection: Video conferencing has revolutionised socialisation by overcoming physical distances, allowing people to maintain personal connections no matter where they are. Friends and family can see and talk to each other regularly, which helps them stay in touch and share important moments, especially when travel is not possible, such as during the COVID-19 pandemic. It enables virtual gatherings like family reunions, birthday parties, and holiday celebrations, making everyone feel close and connected despite being far apart. For long-distance relationships, frequent face-to-face communication helps maintain emotional closeness. Video conferencing also supports virtual social events like online game nights, book clubs, and exercise classes, offering new ways to engage socially and build communities. The real-time visual and auditory interaction makes conversations feel more personal and meaningful compared to phone calls or text messages. In summary, video conferencing enhances socialisation by providing an accessible and versatile way to connect, strengthening relationships, and fostering community.

Business Communication: Video conferencing is essential for businesses because it changes how companies communicate and work together. It allows teams, clients, and stakeholders in different places to talk in real-time, which is essential in today's global market. By holding virtual meetings, businesses save time and money by reducing the need for travel, letting employees focus more on

their work. It also supports remote work, which can increase employee satisfaction and retention. Video conferencing makes collaboration easier with tools like screen sharing and virtual whiteboards, allowing teams to work on projects together from different locations. This technology helps businesses respond quickly to changes and make fast decisions by connecting key people instantly. It's also great for training and development, making it easy to run webinars and training sessions. Additionally, video conferencing improves customer service by enabling face-to-face interactions, building stronger relationships with clients. Overall, it enhances communication, boosts productivity, and makes collaboration and innovation easier, making it an essential tool for modern businesses.

Environmental Impact: Video conferencing also plays a prominent role in protecting the environment because it reduces the need for travel, which cuts down on carbon emissions and other pollutants from transportation. By holding meetings online instead of flying or driving, businesses and individuals use less fossil fuel, helping to lower air pollution and combat climate change. This reduction in travel also decreases traffic and the need for infrastructure like roads and airports, which can harm natural habitats. Additionally, video conferencing supports remote work and virtual events, leading to lower energy use in office buildings and event spaces. This means less energy is needed for heating, cooling, and lighting, further reducing the carbon footprint of companies. It also encourages the digital sharing of documents, reducing the need for paper and other physical materials. Overall, video conferencing helps promote environmental sustainability by lowering travel-related emissions, conserving energy, and using resources more efficiently, which helps protect the planet for future generations.

Video conferencing in everyday life: It has become a key part of daily life, changing how we interact and communicate with each other. It helps families and friends who live far apart stay in touch by allowing them to see and talk to each other regularly, which strengthens their relationships. Videoconferencing played a significant role during the COVID-19 pandemic when people needed to stay connected while following social distancing rules. Besides personal connections, video conferencing is useful for everyday activities like attending virtual events, online classes, and community meetings. It offers flexibility and convenience, as people can join from anywhere without travelling, saving time and reducing stress. For those working from home, video conferencing helps them stay connected with colleagues and remain productive. It also supports various hobbies by enabling virtual clubs, fitness classes, and hobby groups to meet online. Additionally, it allows people to access services like telehealth appointments, where they can consult with doctors from home.

Overall, video conferencing makes daily life better by keeping people connected, supporting remote work and learning, and making important services more accessible.

Overall, video conferencing connects people, helps them work together, improves learning, makes healthcare more accessible, supports social relationships, helps businesses, and helps protect the environment.

Check your progress:

1. Video conferencing platforms like Zoom and Google Meet allow screen sharing. (True or False)

13.2.4 Video Conferencing Tools

Now let us discuss video conferencing tools. Video conferencing tools are software that lets people have virtual meetings with live audio and video over the internet. They are crucial in business, education, healthcare, and personal communication. Here are details about popular video conferencing tools, what they do, and how they're used:

Zoom: Features: Zoom has high-definition video and audio, screen sharing, virtual backgrounds, and breakout rooms. It can handle large meetings with up to 1,000 people and webinars with up to 10,000 viewers.

Uses: It's widely used in business for team meetings and online training. In education, it's used for virtual classrooms and remote learning. It's also used in healthcare for telemedicine.

Microsoft Teams: Features: Integrated with Microsoft 365, it offers video calls, chat, file sharing, and tools for working together on documents. It includes features like background blur and meeting recording.

Uses: Common in business for internal communication and project management. In education, it's used for classes and group projects.

Google Meet: Features: Google Meet offers video and audio calls, screen sharing, real-time captions, and works with Google Workspace. It can host up to 250 people in a meeting.

Uses: Used in business for meetings and client talks, in education for online classes, and for personal calls with friends and family.

Cisco Webex: Features: Provides high-quality video and audio, screen sharing, meeting recording, and virtual backgrounds. It's known for security and managing big webinars and events.

Uses: Used in business for secure meetings and webinars. In education, it's used for online classes. In healthcare, it's used for secure telehealth services.

Skype: Features: Skype offers video calls, instant messaging, screen sharing, and file sharing. It supports group calls with up to 50 people.

Uses: Used for personal calls with friends and family, small business meetings, and education for tutoring.

GoToMeeting: Features: It has high-definition video, screen sharing, meeting recording, and tools for drawing during presentations. It can have up to 250 people in a meeting.

Uses: Used in business for client meetings, sales talks, and team collaboration. It's also used for training and webinars.

Slack Video Calls: Features: Integrated with Slack, it offers video and audio calls, screen sharing, and tools for working together. It supports group calls with up to 15 people.

Uses: Used in business for team chats and quick meetings.

Jitsi Meet: Features: It's open-source and free, with video calls, screen sharing, chat, and meeting recording. It works without an account and can have an unlimited number of people.

Uses: Used for personal calls, small business meetings, and community groups. In education, it's used for study groups.

13.2.5 Setting Up and Joining a Meeting on Zoom

A) Setting Up a Zoom Meeting

1. **Sign In to Your Zoom Account**:
   ○ Go to the Zoom website and sign in with your Zoom account credentials. If you don't have an account, you can create one for free.

2. **Schedule a Meeting**:
   ○ After signing in, click on the **Schedule a Meeting** button in the top-right corner of the page.

3. **Fill Out Meeting Details**:
   ○ Enter the meeting details, including:
      ■ **Topic**: The name of your meeting.
      ■ **Description**: (Optional) A brief description of the meeting.
      ■ **When**: The date and time of the meeting.
      ■ **Duration**: The length of the meeting.
      ■ **Time Zone**: The time zone of the meeting.

- ■ **Recurring Meeting**: Check this if you want to set up a recurring meeting.

4. **Meeting ID**:
   - ○ Choose either **Generate Automatically** or **Personal Meeting ID**.

5. **Meeting Password**:
   - ○ (Optional) Set a password for the meeting to enhance security.

6. **Video and Audio Settings**:
   - ○ Choose whether the host and participants' video will be on or off when they join the meeting.
   - ○ Select audio options (Telephone and Computer Audio is recommended).

7. **Meeting Options**:
   - ○ Enable options such as **Enable join before host**, **Mute participants upon entry**, **Enable waiting room**, etc., based on your preferences.

8. **Save the Meeting**:
   - ○ Click the **Save** button to schedule your meeting.

9. **Share the Meeting Invitation**:
   - ○ After saving, you will see options to add the meeting to your calendar and copy the invitation link. Share this link with the participants via email or other communication channels.

B) Joining a Zoom Meeting

1. **Receive the Meeting Invitation**:
   - ○ You will receive a meeting invitation with a link from the host. This link will include all the necessary details to join the meeting.

2. **Click the Meeting Link**:
   - ○ At the scheduled meeting time, click on the invitation link provided by the host.

3. **Open Zoom**:
   - ○ If you have the Zoom app installed, it will open automatically. If not, you will be prompted to download and install the app. Follow the instructions to install Zoom.

4. **Join the Meeting**:
   - ○ Once Zoom opens, you will see a **Join Meeting** screen. Enter your name (the name you want to display in the meeting) and click **Join**.

5. **Enter the Meeting Password**:
   - ○ If the host has set a meeting password, you will be prompted to enter it. Type in the password and click **Join Meeting**.
6. **Choose Your Audio and Video Settings**:
   - ○ You will be given options to join with computer audio and to start your video. Adjust these settings according to your preference and click **Join with Computer Audio**.
7. **Wait for the Host to Start the Meeting**:
   - ○ If you join before the host, you might see a message that says, "Please wait for the host to start this meeting." Once the host starts the meeting, you will be automatically admitted.

13.2.6 Setting up and Joining a Meeting on Google Meet

A) Setting Up a Google Meet Meeting

Method 1: Using Google Calendar

1. Go to calendar.google.com and sign in to your Google account.
2. Click on the "Create" button or select a time slot on your calendar.
3. In the event details, click "Add Google Meet video conferencing."
4. Fill in the event title, time, and any other relevant details.
5. Click "Save."
6. Share the meeting link with participants by copying it from the event details or sending the calendar invite.

Method 2: Using the Google Meet App

1. Open the Google Meet app on your mobile device.
2. Tap "New meeting."
3. Choose one of the following options:
   - ○ **Start an instant meeting:** This will create a meeting instantly, and you can share the link with participants.
   - ○ **Get a meeting link to share:** This will generate a meeting link that you can share with participants for a future meeting.
   - ○ **Schedule a meeting in Google Calendar:** This will open Google Calendar to schedule a meeting with Google Meet integration.

B) Joining a Google Meet Meeting

245

Method 1: Using a Meeting Link

1. Open your web browser and go to meet.google.com.
2. Enter the meeting code or link you received in the "Enter a code or link" field.
3. Click "Join."

Method 2: Using Google Calendar

1. Open the calendar invite for the meeting.
2. Click the "Join with Google Meet" button.

Choosing the Right Tool: When picking a video conferencing tool, think about how many people will be in the meeting, what features you need (like recording or screen sharing), how easy it is to use, and how much it costs. Each tool is useful for different things, so pick the one that works best for what you need. Therefore, video conferencing tools are important for modern communication. They let businesses, schools, doctors, and people everywhere talk and work together, no matter where they are. Using these tools makes it easy to keep doing things even when people can't meet face-to-face.

13.2.7 Let Us Sum Up

In this Unit, we have discussed video conferencing and the various tools used for this technology in detail. We can conclude that video conferencing has become an essential tool in many aspects of life, offering numerous benefits across education, business, socialising, environmental sustainability, and healthcare. It bridges the gap created by physical distances, allowing families, friends, and colleagues to stay connected, no matter their location.

In education, video conferencing provides flexible and accessible learning opportunities, enabling students to attend classes from anywhere. In the business world, it fosters collaboration, reduces travel costs, and enhances productivity. Socially, it helps maintain relationships and facilitates community engagement through virtual events and gatherings, overcoming geographical barriers.

From an environmental perspective, videoconferencing supports sustainability by reducing the need for travel, which lowers carbon emissions and conserves energy. In healthcare, it enables remote consultations and continuous care, making healthcare services more accessible to a wider population.

Overall, video conferencing enhances efficiency, convenience, and connectivity while promoting a more sustainable world. It has become a crucial tool in modern life, playing a key role in both personal and professional environments.

13.3 Learning Outcomes

Now that you have completed the Unit, you can:

- Explain what video conferencing is and its importance in modern communication.
- Identify common use cases for video conferencing in both professional and personal contexts.
- Explore various video conferencing tools and platforms such as Zoom, Microsoft Teams, Google Meet, and Skype.
- Demonstrate how to set up a video conference, including scheduling meetings and inviting participants.

13.4 Glossary

- **Remote Work:** A work arrangement that allows employees to work from locations other than a central office, often enabled by video conferencing tools.
- **Webinar:** A seminar or presentation conducted over the internet, typically involving video conferencing software for interactive communication.
- **Virtual Background**: A feature in video conferencing software that allows users to replace their physical background with an image or video.
- **Virtual Whiteboard:** A feature of video conferencing software that allows participants to draw, write, and brainstorm ideas together on a shared digital space.
- **Screen Sharing**: A feature of video conferencing tools that allows participants to show their computer screen to others in the call, facilitating presentations, demonstrations, and collaborative work.

13.5 Sample Questions

13.5.1 Objective Questions

1. What is video conferencing?

  a) A method of sending text messages

  b) A technology that allows real-time audio and video communication over the internet

c) A tool used only for social media interactions

d) A device for watching pre-recorded videos

2. Which of the following is NOT a common use of video conferencing?

a) Remote work meetings

b) Online education

c) Telemedicine

d) Watching television shows

3. Which protocol is commonly used for real-time video and audio transmission?

a) HTTP

b) FTP

c) WebRTC

d) SMTP

4. Which of the following is an advantage of video conferencing in education?

a) Students can attend live classes from anywhere

b) Teachers cannot interact with students

c) It eliminates the need for assignments

d) It replaces textbooks entirely

5. How does video conferencing contribute to healthcare?

a) It replaces doctors with artificial intelligence

b) It allows remote patient consultations and collaboration among doctors

c) It eliminates the need for physical hospitals

d) It only works for urban patients

6. Which of the following is a key environmental benefit of video conferencing?

a) Increases air pollution

b) Reduces the need for travel, lowering carbon emissions

c) Consumes more fossil fuel

d) Increases deforestation

7. Which of these is NOT a common feature of video conferencing tools?

a) Screen sharing

b) Virtual whiteboards

c) Real-time text translation

d) Meeting recording

8. What is an essential requirement for a smooth video conferencing experience?

  a) A high-speed and stable internet connection

  b) A landline telephone

  c) A large television screen

  d) A fax machine

9. Which video conferencing tool is integrated with Microsoft 365 and supports chat, file sharing, and video calls?

  a) Zoom

  b) Skype

  c) Microsoft Teams

  d) Google Meet

10. What is a crucial step when setting up a Zoom meeting?

  a) Buying a new computer

  b) Setting up a meeting password (optional)

  c) Printing the meeting invitation

  d) Installing a landline phone

13.5.2 Short Answers Questions

1. Describe the process of videoconferencing, from capturing video and audio to displaying it on screens.
2. Discuss the importance of stable and rapid internet connections in video conferencing.
3. How does video conferencing enhance remote learning?
4. What are the different video conferencing tools used for day-to-day communication?
5. How did video conferencing help business flow during the COVID-19 pandemic?

13.5.3 Long Answer Questions

1. Discuss the impact of video conferencing on education. How has it transformed the learning experience for students and teachers?
2. Explain how video conferencing has changed business communication. Provide examples of how different businesses use video conferencing tools.
3. Analyse the role of video conferencing in socialisation and community building. Provide examples of virtual social events and their impact on social interactions.

13.6 Suggested Learning Resources

Carlson, G. E. *Effective Video Conferencing in Educational Settings: A Literature Review.* Greenwood Publishing Group, 1999.

Gough, M. *Video Conferencing over IP: Configure, Secure, and Troubleshoot.* Cisco Press, 2006.

House, C. H., and Yost, D. A. *Video Conferencing: The Whole Picture.* Academic Press, 2003.

Unit-14: Social Media and Mobile Applications

Structure

14.0 Introduction
14.1 Objectives
14.2 Social Media
      14.2.1 Scope of Social Media
      14.2.2 Historical development of social media
      14.2.3 Popular Social Media Platforms
      14.2.4 Mobile Applications and their Importance
      14.2.5 Synergy between Social Media and Mobile Apps
      14.2.6 Impact on Communication and Society
      14.2.7 Benefits and Risks
      14.2.8 Let Us Sum Up
14.3 Learning Outcomes
14.4 Glossary
14.5 Sample Questions
14.6 Suggested Learning Resources

14.0 Introduction

Social media has become a crucial aspect of our everyday lives, changing the way we interact, exchange knowledge, and build relationships with other people. In this section, we're going to get into a detailed explanation of social media and its wide-ranging effects on society. We'll explore its different aspects and how it influences our lives.

Social media refers to a digital platform or online technology that enables individuals and groups to create, share, and exchange information, ideas, messages, and multimedia content in a virtual social environment. It encompasses a wide range of web-based and mobile applications that facilitate user-generated content, interaction, and collaboration, often in real-time.

In this Unit, we will explore scope of social media, its historical development, its impact on communication and society, and its benefits and risks.

14.1 Objectives

By the end of this Unit, learners should be able to:

1. Describe the key milestones in the historical development of social media, from its pre-internet origins to the sophisticated platforms of today.

2. Analyse how the use of social media and mobile apps has altered communication patterns, including the shift towards instant, multimedia-rich, and globally connected communication.

3. Evaluate the broader societal effects and implications of social media and mobile app technologies, including their impact on social activism, privacy, mental health, and information dissemination.

4. Enumerate the advantages of using social media and mobile apps while also addressing privacy and security concerns associated with their usage.

5. Identify current trends and innovations in the social media landscape, such as the rise of short video content and audio-based conversations.

14.2 Social Media

14.2.1 Scope of social media

The scope of social media is expansive and continuously evolving, with various dimensions that encompass communication, technology, business, and societal aspects. Here, we break down the scope into key components:

1. Communication and Interaction:

- Social media platforms enable individuals to connect and communicate with family, friends, colleagues, experts, academicians, and even strangers across the globe.
- Users can share text-based messages, images, videos, and audio recordings, fostering meaningful interactions and relationships.
- Real-time messaging, commenting, and sharing features enhance communication.

2. Information Sharing and Dissemination:

- Social media is a wonderful way to share news, information, and updates about various topics, including current events as well as individual interests.

- Users can follow and subscribe to content creators, news outlets, and organisations to stay updated and informed.

3. User-generated Content:
- Social media encourages the creation and sharing of user-generated content, including blogs, vlogs, photos, podcasts, testimonials, and user reviews.
- It empowers individuals to become content creators and influencers in their respective niches.

4. Multimedia Content:
- The scope of social media extends to multimedia content such as photos, videos, live streams, and podcasts, making it a versatile platform for creative expression.

5. Networking and Professional Opportunities:
- Social media platforms like LinkedIn facilitate professional networking, job searches, and career development.
- Businesses use social media for recruitment, brand promotion, and customer engagement.

6. Business and Marketing:
- Organisations leverage social media for marketing campaigns, brand visibility, and customer engagement.
- Social media advertising, influencer marketing, and analytics are integral components of modern marketing strategies.

7. Social Impact and Activism:
- Social media has played a significant role in social activism, advocacy, and awareness campaigns.
- It provides a platform for marginalised voices and grassroots movements.

8. Privacy and Ethical Considerations:
- The scope of social media also includes concerns related to user privacy, data security, cyberbullying, and ethical dilemmas.
- These issues highlight the need for responsible use and regulation of social media.

In conclusion, social media's scope is vast and multifaceted, encompassing various forms of communication, information sharing, user-generated content, networking, business opportunities, and societal impacts. Understanding this scope is essential for navigating the dynamic landscape of social media and its implications in the digital age.

14.2.2 Historical Development of Social Media

The remarkable evolution of social media has truly transformed the way we interact, connect with others, and share information throughout history. It spans from its earliest origins to the sophisticated platforms that dominate today's digital landscape. This exploration will take us through the key milestones in the history of social media.

Pre-Internet Era: In the years before the widespread use of the internet, the concept of social networking existed in a rudimentary form. During the 1970s and 1980s, Bulletin Board Systems (BBS) allowed users to engage in text-based conversations and share files. Similarly, early online communities like Usenet and The WELL facilitated discussions and the exchange of information among users.

Emergence of Internet-Based Social Media: The advent of the World Wide Web in the early 1990s marked a significant shift. It paved the way for the development of web-based social media platforms. In 1997, SixDegrees.com emerged as one of the first recognised social networking platforms. It enabled users to create profiles and connect with friends. However, SixDegrees.com faced challenges and eventually shut down in 2001.

Rise of Blogging: The late 1990s and early 2000s witnessed the rise of blogging platforms like LiveJournal and Blogger. These platforms allowed individuals to share their personal thoughts, opinions, and expertise, foreshadowing the era of user-generated content.

The Era of Friendster and MySpace: In the early 2000s, platforms like Friendster (2002) and MySpace (2003) brought social networking to a broader audience. Users were able to create profiles on these platforms, connecting with their friends and sharing photos and music. MySpace, in particular, became a hub for musicians and artists.

Facebook's Dominance: The pivotal moment in social media history came with the launch of Facebook in 2004, founded by Mark Zuckerberg. Initially exclusive to college students, Facebook rapidly expanded its user base and introduced innovative features such as the News Feed. This success set the stage for the social media landscape we are familiar with today.

Twitter's Microblogging Revolution: In 2006, Twitter emerged with its unique concept of microblogging, limiting posts to 140 characters. It became a platform for real-time updates, news dissemination, and popularising the use of hashtags (#).

Visual Social Media: Platforms like YouTube (2005) revolutionised content creation and consumption by focusing on video sharing. Instagram (2010) took a similar approach with photo sharing, emphasising visual aesthetics and filters. Pinterest (2010) allowed users to discover and curate visual content.

Professional Networking: LinkedIn (2003) filled the niche of professional networking, connecting job seekers, recruiters, and businesses. It quickly became a vital tool for career development and recruitment.

Messaging Apps and Ephemeral Content: The late 2000s and early 2010s witnessed the emergence of messaging apps like WhatsApp (2009) and Snapchat (2011). These platforms introduced private messaging and emphasised privacy and immediacy in communication.

Current Landscape: Social media's evolution continues to this day. Platforms like TikTok (2016) have taken centre stage with short-form video content, while Clubhouse (2020) focuses on audio-based conversations. The landscape also features established giants like Facebook (now Meta Platforms, Inc.), Twitter (X), and Instagram.

In conclusion, the historical development of social media reflects the dynamic nature of digital communication. It has evolved from text-based forums to the multimedia-rich platforms we use today. Understanding this evolution is crucial for navigating the complex world of contemporary social media.

14.2.3 Popular Social Media Platforms

Social media platforms have become an integral part of modern communication and connectivity. Each platform offers unique features and caters to different user preferences and interests. Here, we identify and explain some of the most popular social media platforms:

1. **Facebook:**
   - **Overview:** Founded in 2004, Facebook is one of the most widely used social networking platforms globally.
   - **Features:** Users can create profiles, connect with friends, and share posts, photos, videos, and links. It also supports groups, events, and marketplace features.
   - **User Base:** Facebook has billions of active users worldwide and is used for personal connections, content sharing, and business promotion.

2. **Instagram:**
   - **Overview:** Acquired by Facebook, Instagram launched in 2010 and focuses on visual content sharing.
   - **Features:** Instagram allows users to share photos and videos on their profiles, Stories, and IGTV. It emphasises visual aesthetics, filters, and hashtags.
   - **User Base:** It is popular among younger demographics and is often used by individuals, influencers, and businesses to showcase visual content.

3. **Twitter (X):**
   - **Overview:** Twitter, founded in 2006, is a microblogging platform known for its short-form posts called "tweets."
   - **Features:** Users share tweets of up to 280 characters, follow others, and engage in real-time conversations. It uses hashtags to categorise content.
   - **User Base:** Twitter is used for news updates, networking, and discussions on a wide range of topics.

4. **LinkedIn:**
   - **Overview:** LinkedIn, which was launched in 2003, is a platform designed for professionals to connect and network with one another.
   - **Features:** The platform offers a variety of features that allow users to create their own professional profiles, connect with colleagues and peers, and share updates and articles. Additionally, it offers job listings and features for recruitment purposes.
   - **User Base:** LinkedIn is a platform that people use to enhance their professional growth, find job opportunities, and connect with other businesses.

5. **YouTube:**
   - **Overview:** YouTube, established in 2005, is a video-sharing platform.
   - **Features:** Users have the ability to upload their own videos, watch videos uploaded by others, and leave comments on them. It includes a diverse range of content, spanning from educational tutorials to entertaining material.
   - **User Base:** YouTube is used by content creators, educators, entertainers, and businesses to share video content.

6. **WhatsApp:**
   - **Overview:** WhatsApp, founded in 2009, is a messaging app owned by Facebook.
   - **Features:** As a user, you have the ability to send text messages, make voice and video calls, share media such as photos and videos, and ensure your privacy through the use of end-to-end encryption.
   - **User Base:** WhatsApp is popular for personal and group messaging, both locally and internationally.

7. **Snapchat:**
   - **Overview:** Launched in 2011, Snapchat is known for its ephemeral content.

- **Features:** Users share photos and videos that disappear after a short time. It also offers stories, filters, and AR features.
- **User Base:** Snapchat is popular among younger users for casual communication and creative expression.

8. **TikTok:**
   - **Overview:** TikTok, created in 2016, is a short video platform.
   - **Features:** Users can create and share short videos with music and creative effects. It emphasises user-generated content and trends.
   - **User Base:** TikTok is known for its entertainment value and is used by a diverse user base.

These popular social media platforms cater to various communication styles, interests, and demographics, offering diverse opportunities for connection, content sharing, and engagement. Users choose platforms based on their preferences and objectives, contributing to the rich and evolving landscape of social media.

14.2.4 Mobile Applications and their Importance

Mobile apps, which are often called "apps," are software programs that are specifically created to be used on mobile devices like smartphones and tablets. These apps serve various purposes and functions, enhancing the capabilities and usability of mobile devices. They have become an integral part of modern digital life, offering convenience, accessibility, and functionality on the go.

Categorizing Mobile Apps

Mobile apps can be categorised into several types based on their functions and intended uses. These categories encompass a wide range of applications, each serving specific needs in contemporary society:

1. **Social Media Apps:**
   - Social media apps, like Facebook, Instagram, Twitter, and TikTok, facilitate social networking, content sharing, and real-time communication with friends, family, and the global community.

2. **Messaging Apps:**
   - Messaging apps, including WhatsApp, Messenger, and Telegram, enable instant text messaging, voice and video calls, and multimedia sharing among individuals and groups.

3. **Productivity and Utility Apps:**
   - Productivity apps like Microsoft Office Suite, Google Workspace, and Evernote help users create, edit, and manage documents, presentations, and notes.
   - Utility apps such as weather apps, calculators, and file managers offer essential tools for everyday tasks.

4. **Entertainment and Media Streaming Apps:**
   - Entertainment apps such as Netflix, YouTube, and Spotify offer a wide range of movies, TV shows, music, and podcasts to enjoy and unwind with.

5. **Gaming Apps:**
   - Gaming apps provide a diverse array of experiences, ranging from relaxing puzzle games to captivating 3D multiplayer adventures. Some examples of popular games are Candy Crush, PUBG, and Fortnite.

6. **E-commerce and Shopping Apps:**
   - E-commerce apps like Amazon, eBay, and Alibaba enable users to shop online, browse products, and make purchases with ease.
   - Food delivery apps like Zomato, Uber Eats and DoorDash offer convenient meal ordering and delivery services.
   - Quick Commerce apps like Zepto, Blinkit, and Dunzo offer your next-door quick delivery of groceries, personal care, electronics, & much more to you in just 10 minutes.

7. **Navigation and Travel Apps:**
   - Navigation apps like Google Maps and Waze provide GPS-based directions, traffic information, and location services.
   - Travel apps assist users in booking flights, hotels, and planning itineraries. Digiyatra, launched on 1st December 2022, produces biometric-enabled seamless travel experiences based on facial recognition technology in airport premises.

8. **Health and Fitness Apps:**

- Health and fitness apps, such as Pregnancy+, Pregnancy and Baby Tracker: WTE, Fitbit, MyFitnessPal, and Headspace, help users track physical activity, monitor health metrics, and practice mindfulness.

9. **Education and Learning Apps:**
   - Education apps like Duolingo, Khan Academy, and Coursera offer online courses, tutorials, and interactive learning experiences.
   - Language apps help learn new languages. Google created Read Along, previously Bolo, a language-learning software for kids on Android. Dia teaches kids to read through illustrated stories. English and Indian main languages, including Hindi, Bengali, Tamil, Telugu, Marathi, and Urdu, can be learnt.

10. **News and Information Apps:**
    - News apps like CNN, BBC, and The New York Times deliver real-time news updates, articles, and multimedia content.
    - Information apps cater to specific interests, providing insights on topics like technology, science, or finance.
    -

The Significance of Mobile Apps in Contemporary Society

Mobile applications have gained immense importance in contemporary society for several reasons:

1. **Accessibility and Convenience:** Apps provide easy access to information and services at users' fingertips, enabling them to accomplish tasks efficiently and conveniently.
2. **Personalisation:** Many apps offer personalised experiences, tailoring content and recommendations to individual preferences and needs.
3. **Enhanced Productivity:** Productivity apps streamline work processes, allowing users to work, collaborate, and stay organised on mobile devices.
4. **Entertainment and Leisure:** Entertainment apps offer diverse forms of entertainment, catering to different tastes and providing a source of relaxation and enjoyment.
5. **Communication:** Messaging and social media apps foster real-time communication and connection with peers and acquaintances, irrespective of geographic distances.
6. **Economic Impact:** E-commerce apps drive online commerce and contribute significantly to the global economy.

7. **Learning and Skill Development:** Educational apps expand access to learning resources and opportunities, empowering individuals to acquire new knowledge and skills.

8. **Health and Wellness:** Health and fitness apps promote physical and mental well-being by tracking health metrics, providing exercise routines, and supporting mindfulness practices.

9. **Information Dissemination:** News and information apps serve as vital sources of current events, updates, and knowledge dissemination.

In conclusion, mobile applications play a pivotal role in contemporary society, offering a diverse range of functions and services that cater to the needs and preferences of users. Their significance extends beyond convenience, influencing how people communicate, work, learn, entertain themselves, and interact with the world around them.

14.2.5 Synergy Between Social Media And Mobile Apps

The integration of social media into mobile applications has become a common and powerful trend in the digital landscape. This synergy capitalises on the popularity of social media platforms and enhances the user experience of mobile apps. Here, we delve into how social media is integrated into mobile applications and provide examples of successful integrations that enhance user experiences.

Integration of Social Media into Mobile Applications:

1. **Social Login and Registration:**
   ● Mobile apps often offer users the option to sign up or log in using their social media profiles (e.g., Facebook, Google, or Apple IDs). This simplifies the registration process and eliminates the need to create new accounts.

2. **Sharing Features:**
   ● Many apps incorporate social sharing buttons, allowing users to share content, achievements, or updates directly to their social media profiles. This promotes user engagement and content dissemination.

3. **Social Feeds and Activity Streams:**
   ● Mobile apps may include social feeds or activity streams that display updates and interactions from a user's social network, creating a more dynamic and socially connected experience within the app.

4. **Social Invitations and Referrals:**

- Apps often encourage users to invite friends to join or refer others by leveraging their social connections. This can be tied to rewards or incentives, promoting app growth.

5. **In-App Social Features:**
   - Some apps build social networking features directly into their platforms, allowing users to connect with others within the app, share content, and engage in discussions or collaborations.

Examples of Successful Integrations:

1. **Spotify:**
   - The music streaming app Spotify allows users to connect their accounts with social media platforms like Facebook. This integration enables users to share playlists, favourite songs, and what they're currently listening to with their friends on Facebook.

2. **Strava:**
   - Strava, a fitness tracking app, integrates with social media platforms to enable users to share their workout activities, achievements, and challenges with their social network. This promotes healthy competition and motivates users to stay active.

3. **Instagram:**
   - Instagram integrates seamlessly with Facebook, its parent company, allowing users to share Instagram posts directly to their Facebook profiles. This integration promotes cross-platform content sharing.

4. **LinkedIn:**
   - LinkedIn integrates with email and mobile contacts to suggest connections from a user's professional network. Users can also share updates and articles directly to their LinkedIn profiles from various mobile apps.

5. **Zynga Games:**
   - Zynga, known for games like FarmVille and Words with Friends, integrates social features, such as inviting friends to play and competing with friends' scores. This fosters a sense of community and competition within the games.

6. **Uber & Ola:**
   - These ride-sharing apps integrate with social media platforms, allowing users to share ride details, ETA, and destination with friends or family for safety and convenience.

7. **Pinterest:**

- Pinterest incorporates a social feed where users can see pins and recommendations from others in their network. This social discovery feature enhances content exploration and engagement.

In these examples, the integration of social media enhances user experiences by fostering connections, promoting content sharing, and facilitating interactions. Successful integrations leverage the social networks and behaviours of users to create a more engaging and socially connected mobile app environment.

Check your progress:

1. The synergy between social media and _____ has revolutionised how people communicate and share information.

14.2.6 Impact on Communication and Society

The widespread use of social media and mobile apps has significantly altered communication patterns, transforming how individuals and society as a whole interact and exchange information. Here, we'll discuss the key ways in which these technologies have reshaped communication and analyse their broader societal effects and implications.

1. Instant Communication:
- Social media and messaging apps enable instant communication regardless of geographic distance. Messages, voice calls, and video chats can occur in real-time, facilitating immediate responses and reducing communication barriers.

2. Expanded Social Networks:
- Social media platforms allow individuals to connect with a broader and more diverse range of people, including friends, family, colleagues, and individuals with shared interests. This expansion of social networks has opened up new opportunities for networking and relationship-building.

3. Visual and Multimedia Communication:
- Mobile apps like Snapchat and Instagram prioritize visual and multimedia communication. Users share photos, videos, and stories, enhancing the expressive and creative aspects of communication.

4. Asynchronous Communication:

- Social media and messaging apps also support asynchronous communication, allowing users to send messages or post updates that can be viewed and responded to at a later time. This flexibility accommodates busy lifestyles.

5. Dissemination of Information:

- Social media serves as a powerful platform for disseminating news, information and updates. Individuals can follow news outlets and influencers, making it easier to stay informed about current events and topics of interest.

6. User-generated Content:

- The prevalence of user-generated content on social media allows individuals to contribute to public discourse and share their perspectives, giving voice to diverse viewpoints and experiences.

7. Impact on Privacy and Security:

- While enhancing communication, social media and mobile apps have raised concerns about user privacy and data security. The sharing of personal information and data breaches have become challenges that individuals and society must navigate.

Broader Societal Effects and Implications:

1. Digital Divide: The digital divide, the gap in access to technology and the internet, can exacerbate existing societal inequalities. Those with limited access may face barriers to social participation and information access.

2. Social Activism and Awareness: Social media has played a pivotal role in social activism, enabling movements like #BlackLivesMatter and #MeToo to gain momentum. It has also facilitated the rapid spread of awareness campaigns and humanitarian efforts.

3. Filter Bubbles and Echo Chambers: Filter bubbles can result from social media algorithmic curating, exposing users to information and opinions that agree with their ideas. This can exacerbate confirmation bias and polarise society.

4. Mental Health Implications: Excessive use of social media has been linked to mental health concerns such as anxiety, depression, and social comparison. Cyberbullying and online harassment are also societal challenges.

5. Disinformation and Misinformation: The ease of sharing information on social media has made it susceptible to disinformation and misinformation. False or misleading content can spread rapidly, affecting public opinion and trust in institutions.

6. Privacy Concerns and Data Ethics: The collection and use of user data by tech companies have raised ethical questions about data privacy and consent. Societal discussions on data ethics and regulation are ongoing.

7. Digital Literacy and Information Literacy: The digital age requires individuals to develop digital literacy and information literacy skills to critically evaluate online content and navigate the complexities of the digital landscape.

In conclusion, the impact of social media and mobile apps on communication and society is multifaceted. While these technologies have enhanced connectivity, facilitated information dissemination, and empowered individuals, they have also introduced challenges related to privacy, inequality, mental health, and the spread of misinformation. Society must adapt and address these implications as technology continues to evolve.

14.2.7 Benefits and Risks

Advantages of Using Social Media and Mobile Apps:

1. **Connectivity and Communication:**
   - Social media and messaging apps enable people to connect and communicate with friends, family, and colleagues globally, fostering relationships and bridging geographical gaps.

2. **Information Access:**
   - These platforms provide easy access to a vast amount of information, news, and educational content, empowering users to stay informed and learn about various topics.

3. **Business and Marketing Opportunities:**
   - Social media platforms offer businesses cost-effective tools for marketing, advertising, and reaching a wider audience. This leads to increased brand visibility and customer engagement.

4. **Entertainment and Relaxation:**
   - Mobile apps offer entertainment options such as games, streaming services, and social content that provide relaxation and enjoyment during leisure time.

5. **Professional Development:**
   - LinkedIn and other professional networking apps assist individuals in career development, job searches, and networking with industry peers and potential employers.

6. **Health and Fitness Tracking:**
   - Health and fitness apps promote physical well-being by tracking exercise routines, diet, and health metrics. They encourage users to maintain a healthier lifestyle.

7. **Community and Support:**
   - Online communities and support groups within mobile apps can be valuable for individuals facing challenges such as mental health issues, addiction, or chronic illnesses.

8. **Social Activism and Awareness:**
   - Social media platforms amplify the voices of activists and promote awareness of social issues, fostering positive change and global solidarity.

Addressing Privacy and Security Concerns:

1. **Data Privacy:**
   - Users should be cautious about sharing personal information on social media. Adjust privacy settings to control who can access your content and information.

2. **Data Security:**
   - Mobile app developers should prioritise data security and encryption to protect user data from breaches or cyberattacks.

3. **Phishing and Scams:**
   - Internet users have to be cautious of phishing scams targeting personal or financial information. Do not click on questionable links or share sensitive info.

4. **Cyberbullying and Harassment:**
   - Social media platforms should implement robust reporting and moderation mechanisms to combat cyberbullying and harassment. Users should report abusive behaviour and protect their online well-being.

5. **Misinformation and Disinformation:**
   - Users should critically evaluate information encountered on social media and mobile apps, cross-referencing with reliable sources to discern fact from fiction.

6. **Digital Literacy:**
   - Promote digital literacy and educate users about online safety, responsible posting, and the potential consequences of sharing sensitive information.

7. **Consent and Permissions:**

- Users should be aware of the permissions requested by mobile apps and carefully consider whether to grant access to their device's camera, microphone, location, and contacts.

8. **Regular Updates and Security Patches:**
   - Keep mobile apps and device operating systems up to date to benefit from security patches and updates that address vulnerabilities.

9. **Two-Factor Authentication (2FA):**
   - To make your online accounts even more secure, enable two-factor authentication whenever you can.

10. **Privacy Settings Review:**
   - Periodically review and update privacy settings on social media platforms and mobile apps to align with your preferences and security needs.

Balancing the benefits of social media and mobile apps with privacy and security concerns requires a proactive approach from both users and developers. By staying informed and practicing responsible online behaviour, individuals can maximise the advantages of these technologies while minimising associated risks. Developers, in turn, should prioritise user data protection and security in their app design and maintenance.

14.2.8 Let Us Sum Up

In this Unit, we have explored the evolution and impact of social media in modern society, covering its scope, historical development, popular platforms, and the role of mobile applications.

We began by discussing the scope of social media, highlighting its vast reach and influence in various sectors, including communication, business, entertainment, and education. The historical development of social media traced its journey from early platforms to the complex networks we use today, emphasising the key milestones that have shaped the way people interact online.

We then examined some of the most popular social media platforms, such as Facebook, Twitter, Instagram, and LinkedIn, noting how each platform serves different purposes and audiences. Alongside this, we delved into the role of mobile applications, discussing their growing importance in enabling access to social media on the go, making communication more instantaneous and widespread.

The synergy between social media and mobile apps was explored, demonstrating how the integration of mobile technology has enhanced user engagement, accessibility, and real-time interactions across social media platforms.

Furthermore, we discussed the impact of social media on communication and society, noting how it has transformed the way people connect, share information, and influence public opinion. While social media brings numerous benefits, such as fostering connections, providing entertainment, and supporting businesses, we also addressed the benefits and risks associated with its use, including issues like privacy concerns, misinformation, cyberbullying, and mental health effects.

In conclusion, social media has become a powerful tool in shaping communication and society, offering both opportunities and challenges. Its widespread influence is undeniable, and understanding its benefits and risks is crucial for responsible use in today's digital world.

14.3 Learning Outcomes

Now that you have completed the Unit, you can:
- Define the scope of social media and explain its impact across various sectors, including communication, business, education, and entertainment.
- Recognise and describe the features and purposes of popular social media platforms like Facebook, Twitter, Instagram, and LinkedIn, and how they serve different audiences and needs.
- Discuss the role of mobile applications in social media, emphasising their significance in providing access, enhancing user engagement, and enabling real-time communication.
- Evaluate the effects of social media on communication, social interactions, and society as a whole, recognising both positive and negative outcomes.
- Examine the benefits of social media, such as fostering connections and business growth, while also identifying potential risks like privacy concerns, misinformation, and mental health impacts.

14.4 Glossary

- **Social Media:** Online platforms and applications that allow users to create, share, and interact with content, as well as communicate with others through messages, posts, and comments.

- **Platform:** A digital service or website where users can create content, connect, and engage with other users. Examples include Facebook, Twitter, Instagram, and LinkedIn.

- **Mobile Applications (Mobile Apps):** Software applications designed for mobile devices (smartphones and tablets) that enable users to access and interact with social media, among other functionalities.

- **Engagement:** The interaction between users and content on social media, including actions like liking, commenting, sharing, or clicking on posts. High engagement often indicates active participation and interest.

- **Misinformation:** False or inaccurate information shared on social media, whether intentionally or unintentionally, can lead to misunderstanding or confusion among users.

- **Hashtag:** A word or phrase preceded by the "#" symbol, used to categorise content on social media and make it discoverable by others interested in the same topic.

- **Influencer:** A person with a large and engaged following on social media who can influence their audience's opinions or behaviour, often through sponsored posts or endorsements.

14.5 Sample Questions

14.5.1 Objective Questions

1. What is social media?
   - a. A type of email service
   - b. A printed newspaper
   - c. **Online platforms for sharing content and connecting with others**
   - d. A type of television broadcast

2. Which of the following is a popular social media platform?
   - a. Gmail
   - b. Microsift Word
   - c. Instagram
   - d. Adobe Acrobat

3. What is a "hashtag" commonly used on social media?

   a. To share email addresses

   b. **To categorize and find related content**

   c. To write blog posts

   d. To design web pages

4. **What does the term "followers" refer to on social media?**

   a. Advertisements on a website

   b. **Users who subscribe to your updates and content**

   c. utomated chatbots

   d. Email subscribers

5. Which of the following actions can you perform on most social media platforms?

   a. **Like, comment, and share posts**

   b. Conduct scientific experiments

   c. File tax returns

   d. Design 3D model

6. A social media _____ is someone who has built a large following and can affect the opinions and behaviours of their audience. (*Answer: influencer)*

7. The practice of using social media platforms to market a product or service is known as _____. *(Answer: social media marketing)*

8. When content spreads rapidly across social media platforms, it is said to go _____. *(Answer: viral)*

9. Social media supports environmental sustainability by reducing the need for _____, thus lowering carbon emissions. *(Answer: travel)*

10. Social media platforms enable users to _____, share, and interact with content online. *(Answer: create)*

14.5.2 Short Answer Questions

1. Describe the primary scope of social media in modern communication.

2. Shed light on the influence of social media on businesses and personal interactions.

3. Trace the historical development of social media and highlight two major milestones that shaped its evolution.

4. Name any three popular social media platforms and briefly explain their unique features and purposes.

5. What are the broader implications of social media for society?

14.5.3 Long Answer Questions

1. Explain the synergy between social media platforms and mobile applications.

2. Evaluate the benefits and risks of social media in today's world.

3. Analyse the impact of social media on communication and society. Include examples to illustrate both positive and negative consequences.

14.6 Suggested Learning Resources

Brown, Darren. *New Social Media for Beginners: The Basics to Start Your Own Online Business.* Independently published, 2024.

Kawasaki, Guy. *The Art of Social Media: Power Tips for Power Users.* Portfolio, 2014.

Unit-15: Translation Tools

Structure

15.0 Introduction

In today's interconnected world, effective communication transcends geographical boundaries and language barriers. The ability to convey ideas, share information, and connect with diverse audiences is paramount, whether you're a global business expanding your reach or an individual navigating the multicultural digital landscape. This is where translation tools come into play, serving as indispensable aids for breaking down linguistic barriers and facilitating cross-cultural communication.

The Unit "Introduction to Translation Tools" delves into the fascinating realm of technology-driven translation, exploring how these tools have become integral in our increasingly globalised society. In this Unit, we embark on a journey to understand the significance of translation tools, their types, functionalities, and the ever-evolving landscape in which they operate.

We commence our exploration by reflecting on the importance of translation in a multicultural world. You'll gain insights into how technology has revolutionized the translation process and bridged

the gap between languages, opening up new avenues for communication, collaboration, and cultural exchange.

As we delve deeper, we categorise translation tools into distinct types, distinguishing between machine translation (MT) and computer-assisted translation (CAT). Additionally, we examine the choices between cloud-based and desktop translation tools, considering their advantages and applications in various contexts.

The Unit navigates through the intricacies of translation memory and terminology management, shedding light on how these components contribute to translation accuracy and consistency. You'll discover the significance of user interfaces and settings in optimising your translation workflow and the critical role of quality assurance in delivering linguistically and culturally accurate translations.

Inevitably, with innovation come challenges, and we'll address them in the context of translation tools. We'll explore the ethical considerations of translation, emphasising cultural sensitivity and responsible translation practices.

Finally, we'll turn our gaze towards the future, exploring the exciting trends on the horizon. Emerging technologies, such as neural machine translation and the growing influence of artificial intelligence and machine learning, are reshaping the translation landscape. This Unit will offer a glimpse into the transformative potential of these technologies and their role in shaping the future of translation.

15.1 Objectives

By the end of this Unit, students will:
- Explain the role and significance of translation tools in a globalised world.
- Differentiate between machine translation and computer-assisted translation.
- Gain proficiency in using popular translation software effectively.
- Manage translation projects and ensure quality control.
- Recognise ethical considerations in translation.
- Explore future trends in translation tools and technology.

15.2 Translation Tools

In a world that thrives on global communication and interaction, the ability to bridge language barriers is of paramount importance. This Unit, "Introduction to Translation Tools," serves as your gateway into the realm of translation technology, where language meets innovation.

In an increasingly interconnected world, people from diverse linguistic backgrounds come together to share ideas, cultures, and knowledge. However, language differences can act as barriers, hindering effective communication and understanding. This section delves into the profound significance of translation in breaking down these barriers, enabling individuals, organisations, and nations to connect, collaborate, and share their experiences.

Technology has revolutionised the field of translation, making it faster, more accurate, and accessible to a global audience. Here, we explore the pivotal role that technology plays in the translation process. From machine translation to computer-assisted translation (CAT) tools, you will gain insight into how innovative solutions are transforming the way we approach language and communication.

As we embark on this journey into the world of translation tools, keep in mind that these tools are not just about converting words from one language to another; they're about fostering understanding, promoting inclusivity, and connecting humanity across linguistic boundaries. Let's embark on this exciting exploration of translation technology and its boundless possibilities.

15.2.1 Types of Translation Tools

When it comes to translation tools, there is a diverse landscape of options available. In this section, we will explore the primary categories of translation tools and the distinctions that set them apart.

Machine Translation (MT) vs. Computer-Assisted Translation (CAT)

In the realm of translation tools, two primary categories stand out: Machine Translation (MT) and Computer-Assisted Translation (CAT). Each of these approaches has its own unique strengths and applications. Let's delve into the differences and characteristics of MT and CAT.

Machine Translation (MT):

Machine Translation, often abbreviated as MT, represents the cutting edge of automation in the world of translation. It employs algorithms and artificial intelligence to perform translations without human intervention. Some well-known examples of MT tools include Google Translate,

DeepL, and Microsoft Translator. Some examples of text translated using Google Translate are given below.
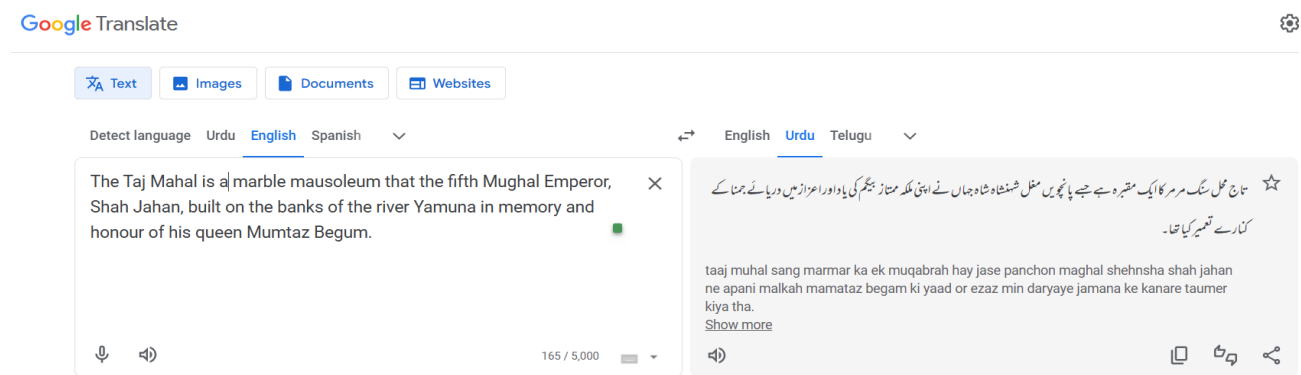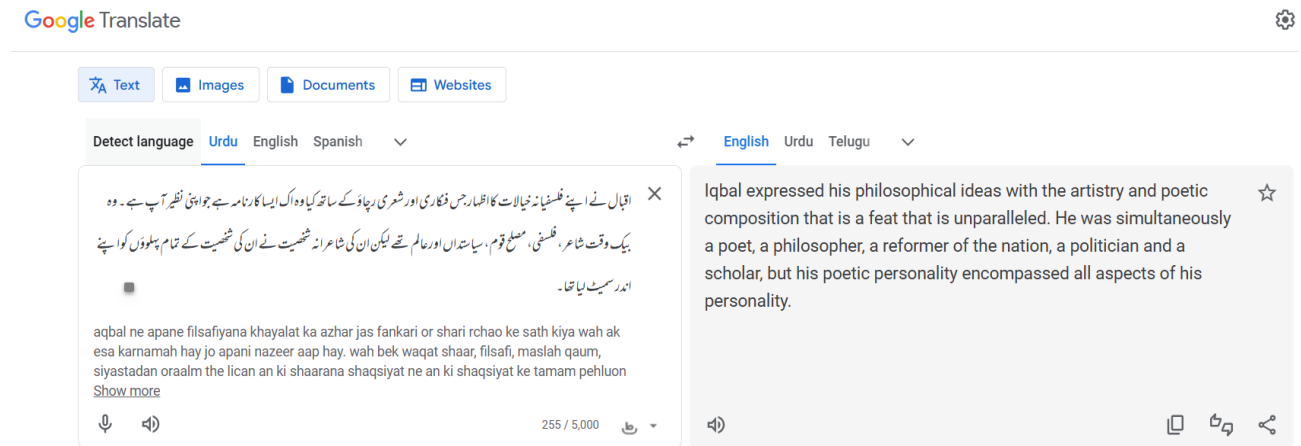
Advantages of Machine Translation:

1. **Speed:** MT tools are incredibly quick and can translate large volumes of text in seconds or less.

2. **Multilingual Capabilities:** They can handle a wide array of languages, making them suitable for quick translations between diverse language pairs.

3. **Cost-effective:** MT is often more cost-effective than human translation, especially for large-scale projects.

Limitations of Machine Translation (MT):

1. **Accuracy:** While MT has improved significantly, it may still produce inaccurate or nonsensical translations, particularly for complex or context-rich content.

2. **Lack of Nuance:** MT tools struggle with nuances, idiomatic expressions, and cultural context, which are crucial for high-quality translation.

3. **No Human Touch:** They lack the human touch that skilled translators bring, making them less suitable for content requiring cultural sensitivity or creativity.

Computer-Assisted Translation (CAT):

Computer-Assisted Translation, known as CAT, combines the strengths of technology with human expertise. CAT tools, such as SDL Trados, memoQ, and Wordfast, are widely used by professional translators.

Advantages of Computer-Assisted Translation (CAT):

1. **Quality and Consistency:** CAT tools help ensure translation quality and consistency by providing translation memory and terminology databases.

2. **Human Involvement:** They involve human translators who can apply their linguistic and cultural knowledge to produce accurate translations.

3. **Customisation:** CAT tools allow customisation to meet specific project requirements, ensuring precise and context-aware translations.

Limitations of Computer-Assisted Translation (CAT):

1. **Learning Curve:** CAT tools may have a learning curve for beginners, and the initial setup can be time-consuming.

2. **Cost:** Professional CAT tools can be relatively expensive, which may not be cost-effective for small scale or one-off projects.

3. **Not Fully Automated:** CAT tools require human translators to operate them effectively, making them unsuitable for fully automated translation.

In summary, the choice between MT and CAT depends on the specific translation project's requirements. MT offers speed and cost-efficiency but may lack accuracy and nuance. CAT, on the other hand, ensures quality and consistency through human involvement but comes with a learning curve and cost considerations. Successful translation projects often involve a strategic blend of both approaches to achieve optimal results.

Cloud-based vs. Desktop Translation Tools:

When it comes to choosing translation tools, another crucial consideration is whether to opt for cloud-based solutions or desktop applications. Both have their merits, and the choice often depends on factors like accessibility, collaboration needs, and personal preferences.

A) **Cloud-based Translation Tools:** Cloud-based translation tools, as the name suggests, operate on remote servers accessible via the internet. Users access these tools through web browsers, making them highly versatile and accessible from anywhere with an internet connection.

Advantages of Cloud-based Translation Tools:

1. **Accessibility:** Perhaps the most significant advantage is accessibility. Cloud-based tools are accessible from any device with internet access, making them ideal for remote work and collaboration among geographically dispersed teams.

2. **Collaboration:** Cloud-based tools facilitate real-time collaboration. Multiple users can work on the same project simultaneously, making them perfect for collaborative translation efforts.

3. **Automatic Updates:** Cloud-based tools are typically updated automatically by the service provider. Users don't need to worry about manually installing updates or patches.

Limitations of Cloud-based Translation Tools:

1. **Internet Dependency:** They require a stable internet connection. Working offline can be a challenge unless the tool offers an offline mode or downloadable files.

2. **Data Security:** Some users may have concerns about data security when working with cloud-based tools, especially for sensitive or confidential content.

B) **Desktop Translation Tools:** Desktop translation tools are software applications installed on a user's computer. These tools operate locally, which means they function independently of an internet connection.

Advantages of Desktop Translation Tools:

1. **Offline Work:** Desktop tools don't depend on an internet connection, making them suitable for translating sensitive or confidential content in secure environments.

2. **Speed:** They can be faster in terms of response time since they don't rely on internet data transfers.

3. **Data Control:** Users have more control over their data, as it resides on their local devices.

Limitations of Desktop Translation Tools:

1. **Limited Accessibility:** Desktop tools are limited to the device they're installed on. Collaboration may require file sharing and manual merging of translations.

2. **Updates and Maintenance:** Users are responsible for manually updating and maintaining desktop applications, which can be time-consuming.

3. **Lack of Real-time Collaboration:** Collaboration is often sequential, as files must be passed between collaborators rather than edited simultaneously.

In conclusion, the choice between cloud-based and desktop translation tools depends on your specific needs and preferences. If you value accessibility, real-time collaboration, and automatic updates, cloud-based tools may be the better choice. On the other hand, if you prioritise offline work, data control, and speed, desktop tools may be the preferred option. Many professionals find that a combination of both types of tools provides flexibility and meets various translation project requirements.

15.2.2 Translation Memory and Terminology Management

In the realm of translation, two essential tools play a pivotal role in ensuring accuracy, consistency, and efficiency: Translation Memory (TM) and Terminology Management. Let's delve into these concepts to understand how they contribute to high-quality translations.

Translation Memory (TM):

The Concept of Translation Memory

Imagine a vast database that stores all your previous translations, sentence by sentence, paragraph by paragraph. This is the essence of Translation Memory (TM). It's a linguistic repository that records your translations and the source text, aligning them in a structured database. When you encounter a similar or identical sentence in a new text, the TM system automatically suggests the previous translation, thereby saving time and ensuring consistency.

Key elements of translation memory include:

1. **Segments:** Texts are divided into segments, which can be sentences, paragraphs, or smaller units.
2. **Alignment:** The source text and its corresponding translation are aligned, creating a bilingual database.
3. **Fuzzy Matching:** TM systems can handle variations of previously translated text, providing suggestions even when the new text is not an exact match.

The advantages of using Translation Memory are substantial:

- **Consistency:** It ensures uniformity in terminology and style across documents, even when they are translated by different translators.
- **Time Efficiency:** Repetitive content is translated faster since the system recalls previous translations.
- **Cost Savings:** As translation time decreases, costs decrease as well.

Terminology Management:

How Terminology Management Enhances Translation Accuracy

Terminology Management involves the systematic collection, organization, and control of specialized terminology related to a specific field, subject, or industry. In the context of translation, precise terminology is vital to accurately convey the meaning of the source text.

Here's how Terminology Management contributes to translation accuracy:

1. **Consistency:** It ensures that the same terminology is used consistently throughout a translation, aligning with industry standards and client preferences.
2. **Clarity:** Precise terminology reduces ambiguity, making the translated content clearer and more understandable to the target audience.
3. **Credibility:** Proper terminology usage enhances the credibility of the translation, especially in technical or specialised fields.
4. **Efficiency:** Translators can quickly access approved terminology, streamlining the translation process.

To manage terminology effectively, translators often use specialised tools or databases that house approved terms, definitions, and context. These resources are consulted during the translation process to ensure that the correct terms are used consistently.

In summary, Translation Memory and Terminology Management are indispensable tools in the world of translation. TM facilitates the reuse of previous translations for efficiency and consistency, while Terminology Management ensures the accurate and consistent use of specialised terms. Together, they elevate the quality of translations, making them more precise, understandable, and credible.

15.2.3 User Interface and Navigation

When working with translation tools, mastering the user interface and navigation is essential to ensuring a smooth and efficient translation process. In this section, we will explore the key aspects of user interface and navigation, helping you become proficient in using translation software effectively.

Navigating and Using Translation Software Effectively:

1. **Dashboard Overview:** Most translation tools feature a dashboard that serves as the central hub for your translation projects. This dashboard provides an overview of ongoing projects, pending tasks, and available resources.
2. **Creating New Projects:** Learn how to initiate new translation projects, import source files, and set project parameters such as target language and deadlines.

3. **File Management:** Understand how to organise and manage files within the software. This includes uploading source files, saving translations, and exporting finished work.

4. **Translation Editor:** Explore the translation editor, where you will spend most of your time. Familiarise yourself with the interface, including the source text display, translation input, and any additional features like terminology or translation memory suggestions.

5. **Formatting Tools:** Discover how to handle text formatting, including fonts, styles, and special characters, to ensure that the translated content matches the source document's formatting.

6. **Quality Assurance:** Learn how to use built-in quality assurance tools to identify and correct errors in your translations. These tools may include spell check, grammar check, and consistency checks.

Customising Settings for Efficient Translation Workflows:

1. **Preferences:** Explore software preferences to customise the user experience. You can often adjust settings related to language preferences, auto-save intervals, and keyboard shortcuts to match your workflow.

2. **Translation Memory Management:** Understand how to configure and manage your Translation Memory settings. This includes specifying when and how the TM should provide suggestions, as well as managing your TM database.

3. **Terminology Management:** Customise terminology databases to align with specific projects or industries. This ensures that the software suggests the appropriate specialised terminology during translation.

4. **User Profiles:** If working in a team, learn how to set up and manage user profiles, granting different permissions and access levels to team members.

5. **Integration:** Explore integration options with other tools or platforms, such as content management systems (CMS) or machine translation engines, to streamline your translation workflow.

6. **Backup and Recovery:** Familiarise yourself with backup and recovery options, ensuring that your work is safeguarded in case of unexpected issues.

By becoming proficient in navigating the user interface and customising settings to suit your needs, you will optimise your translation workflow. These skills are essential for efficient and accurate translation work, whether you are translating documents, websites, or software interfaces.

1. What is the primary purpose of a translation memory in translation tools?

15.2.4 Quality Assurance in Translation

Quality assurance is a critical aspect of the translation process. It ensures that the translated content meets the highest standards of linguistic and cultural accuracy. In this section, we will delve into the key components of quality assurance in translation, equipping you with the knowledge and tools needed to deliver top-notch translations.

Implementing Quality Control Checks:

1. **Pre-Translation Checks:** Before you begin translating, it's essential to perform pre-translation checks. This involves reviewing the source text for clarity, completeness, and any potential issues that may affect the translation process. Ensure that you have a clear understanding of the context and target audience.

2. **Translation Tools:** Learn how to leverage the built-in quality control features of your translation software. These may include spelling and grammar checks, consistency checks, and style guide adherence.

3. **Revision and Editing:** Incorporate a revision and editing phase into your workflow. After completing the initial translation, review and refine it for accuracy, fluency, and adherence to client-specific guidelines.

4. **Peer Review:** Consider peer review as a quality control measure. Having a colleague or fellow translator review your work can provide valuable insights and catch errors that you might have missed.

5. **Client Feedback:** Be open to client feedback and revisions. Clients often have specific preferences and expectations, so maintaining clear communication and a willingness to make adjustments is crucial.

Ensuring Linguistic and Cultural Accuracy in Translations:

1. **Linguistic Proficiency:** As a translator, it's essential to maintain a high level of linguistic proficiency in both the source and target languages. This includes a deep understanding of grammar, syntax, idiomatic expressions, and language nuances.

2. **Cultural Sensitivity:** Recognise the significance of cultural sensitivity in translation. Be mindful of cultural nuances, norms, and taboos that may impact the translation's appropriateness and effectiveness.

3. **Contextual Understanding:** Understand the context in which the translated content will be used. Tailor your translations to suit the context, whether it's for marketing materials, legal documents, or technical manuals.

4. **Terminology Consistency:** Consistency in terminology is crucial. Utilise specialised glossaries and terminology databases to maintain consistency throughout the translation.

5. **Localisation:** Consider localisation when translating content. Adapt the translation to suit regional variations, dialects, and cultural preferences.

6. **Cultural References:** Be aware of cultural references in the source text. When translating idiomatic expressions or references specific to one culture, find suitable equivalents or explanations in the target language.

7. **Client Guidelines:** Adhere to any client-specific guidelines, style guides, or glossaries. Clients may have established preferences for tone, style, and terminology.

By implementing quality control checks and prioritising linguistic and cultural accuracy, you will produce translations that resonate with the target audience and meet the highest standards. Quality assurance is an ongoing process in translation, and continuous improvement is key to delivering exceptional results.

15.2.5 Challenges and Ethical Considerations

The world of translation, especially in the context of translation tools, presents its own set of challenges and ethical considerations. In this section, we will explore some of the common challenges faced by translators using translation tools and delve into the ethical considerations that guide the translation process.

Addressing challenges in automated Translation:

1. **Machine Translation Limitations:** Automated translation tools, while powerful, have limitations. They may struggle with complex sentence structures, idiomatic expressions, and nuanced content. Learn to identify situations where human intervention is necessary to improve translation quality.

2. **Loss of Context:** Automated tools may not always capture the context of the content being translated. This can lead to errors or misunderstandings. Translators must bridge these gaps by providing context or conducting additional research.

3. **Post-Editing:** Post-editing is often required when using machine translation. This involves reviewing and correcting the output to ensure accuracy, fluency, and cultural relevance. Understand the nuances of effective post-editing.

4. **Data Privacy:** When using cloud-based translation tools, be aware of data privacy concerns. Understand the platform's data handling practices and ensure the security of sensitive information.

Ethical Considerations in Translation:

1. **Cultural Sensitivity:** Ethical translation demands a deep understanding of cultural sensitivity. Avoid cultural stereotypes or biases in your translations. Be aware of potentially offensive content and find appropriate ways to handle it.

2. **Respect for Source Text:** Maintain respect for the source text and the author's intent. Avoid altering the meaning or tone of the original content unless explicitly instructed by the client.

3. **Confidentiality:** Uphold confidentiality and non-disclosure agreements when working with sensitive or proprietary content. Protect client information and data.

4. **Accuracy:** Ethical translation places a high premium on accuracy. Ensure that your translations are faithful to the source text and convey the intended message without distortion.

5. **Attribution and Plagiarism:** Give proper attribution when translating content that is not your own. Avoid plagiarism and respect copyright laws and intellectual property rights.

6. **Professionalism:** Maintain professionalism in all your interactions with clients, colleagues, and collaborators. Adhere to deadlines, communicate clearly, and conduct yourself ethically in all business dealings.

7. **Informed Consent:** If the translation involves potentially sensitive or controversial topics, seek informed consent from clients regarding how such content will be handled and translated.

8. **Continuous Learning:** Stay updated with evolving ethical standards in the translation industry. Attend training, workshops, and conferences to enhance your ethical translation practices.

Ethical considerations are at the core of responsible and effective translation. By addressing challenges with a commitment to accuracy, context, and respect for cultural nuances, you can navigate the complexities of translation tools ethically and professionally.

15.2.6 Future Trends in Translation Tools

The world of translation is in a constant state of evolution, driven by technological advancements and changing linguistic landscapes. As we look ahead, several trends are shaping the future of translation tools.

Emerging Technologies and Their Impact on Translation:

1. **Neural Machine Translation (NMT):** One of the most significant advancements in recent years is Neural Machine Translation. NMT models, based on artificial neural networks, have improved the fluency and accuracy of translations, especially for languages with complex structures.

2. **Real-time Translation:** The demand for real-time translation tools is growing, fuelled by global communication and business collaborations. Tools that offer instantaneous translation during live conversations are becoming more sophisticated.

3. **Multimodal Translation:** Future translation tools are likely to support not only text but also other modes of communication, such as audio and video. This will enable seamless translation of multimedia content.

4. **Voice Recognition and Translation:** With the rise of voice-activated devices, voice recognition and translation tools are gaining prominence. Users can expect more accurate and natural translations in voice-based interactions.

The Role of Artificial Intelligence (AI) and Machine Learning (ML) in Translation:

1. **Enhanced Context Understanding:** AI and ML are improving translation tools' ability to understand context. This means translations will be more contextually accurate, considering the broader meaning of sentences.

2. **Customisation:** AI-driven translation tools can be customised to individual preferences and industries. They can adapt to specific terminologies and writing styles, making them invaluable for specialised fields.

3. **Quality Control:** AI can assist in real-time quality control, flagging potential errors, ambiguities, or mistranslations. This aids human translators and post-editors in producing higher-quality translations.

4. **Big Data Utilisation:** Machine learning algorithms can analyse vast amounts of multilingual data to enhance translation accuracy. They can identify patterns and trends that contribute to better translations over time.

5. **Language Expansion:** AI-driven tools are accelerating the inclusion of less common languages in translation services. This promotes linguistic diversity and access to information in under-represented languages.

6. **Human-AI Collaboration:** The future of translation may see a greater collaboration between human translators and AI tools. Translators will rely on AI for assistance, improving efficiency without compromising quality.

As translation tools continue to integrate AI and adapt to emerging technologies, they offer the promise of more accurate, efficient, and versatile translation services. Professionals in various fields, from business to healthcare, can leverage these tools to communicate effectively across language barriers.

15.2.7 Points to Remember

1. Translation tools play a crucial role in breaking down language barriers and enabling effective global communication.

2. Technology has revolutionised the translation process, making it more accessible and efficient.

3. Machine Translation (MT) provides automated translations, while Computer-Assisted Translation (CAT) tools aid human translators.

4. between cloud-based tools for flexibility and collaboration or desktop tools for offline work.

5. Translation memory maintains a database of past translations to enhance consistency and efficiency.

6. Effective terminology management ensures accurate translations by maintaining a consistent vocabulary.

7. Familiarise yourself with the user interface and customise settings to optimise your translation workflow.

8. Implement quality control checks to ensure accurate and culturally sensitive translations.

9. Be aware of ethical considerations in translation, including cultural sensitivity and responsible practices.
10. Stay informed about emerging technologies like neural machine translation and the role of AI and machine learning in translation's future.

15.2.8 Let Us Sum Up

This Unit provides a comprehensive overview of translation tools, highlighting their essential role in modern translation practices. It begins by classifying the different types of translation tools, such as machine translation, computer-assisted translation (CAT) tools, and hybrid systems, emphasising their unique functionalities and use cases.

The Unit then explores the concepts of translation memory (TM) and terminology management, which are vital for ensuring consistency and efficiency in translations. These tools save time by reusing previously translated content and maintaining uniformity across specialised texts.

A focus on user interface and navigation underscores the importance of intuitive designs in enhancing user productivity and accessibility. The Unit also addresses the critical aspect of quality assurance, detailing how built-in features like error detection and consistency checks improve the overall reliability of translations.

The challenges associated with translation tools, such as managing cultural nuances, contextual accuracy, and ethical concerns like data privacy, are discussed, highlighting the complexities of relying on automation in sensitive contexts.

Finally, the Unit looks forward to future trends, including advancements in AI-driven neural machine translation, real-time multilingual communication, and the integration of emerging technologies like AR and VR.

15.3 Learning Outcomes

Now that you have completed the Unit, you should be able to:
- Recognise various types of translation tools, including machine translation, computer-assisted translation (CAT) tools, and hybrid systems, and understand their specific applications.
- Explain the significance of translation memory (TM) and terminology management tools in ensuring consistency and efficiency in translation projects.

- Describe the features of user-friendly interfaces and how effective navigation enhances productivity when using translation tools.
- Apply quality assurance features, such as error detection and consistency checks, to produce accurate and reliable translations.
- Analyse the challenges of translation tools, including cultural nuances, contextual accuracy, and ethical implications like data privacy and over-reliance on automation.
- Discuss emerging trends in translation tools, such as AI-driven advancements, real-time communication, and the integration of augmented and virtual reality.

15.4 Glossary

- **Translation Tools:** Software or applications used to facilitate the process of translating text from one language to another.
- **Machine Translation (MT):** Automated translation performed by computer algorithms without human intervention.
- **Computer-Assisted Translation (CAT):** Translation tools that aid human translators by providing suggestions, terminology databases, and translation memory.
- **Translation Memory:** A database that stores previously translated segments of text for reuse in future translations, ensuring consistency.
- **Terminology Management:** The practice of maintaining a consistent and accurate vocabulary and terminology during translation.
- **User Interface:** The graphical layout and navigational elements of translation software that enable users to interact with the tool.
- **Quality Assurance (QA):** The process of systematically reviewing and verifying translations to ensure linguistic and cultural accuracy.
- **Ethical Considerations:** Factors such as cultural sensitivity, privacy, and responsible translation practices that influence ethical decision-making in translation.
- **Global Communication:** The exchange of information and ideas across cultural and linguistic boundaries.

15.5 Sample Questions

15.5.1 Objective Questions

1. Which of the following is a primary type of translation tool?

    a) Word processors

    b) Neural machine translation

    c) Spell-checking software

    d) Text editors

2. What is the main purpose of translation memory (TM)?

    a) To translate text in real-time

    b) To store previously translated content for reuse

    c) To provide cultural context in translations

    d) To enhance the speed of manual typing

3. Which of the following is NOT an example of a computer-assisted translation (CAT) tool?

    a) SDL Trados

    b) MemoQ

    c) Grammarly

    d) Wordfast

4. Terminology management tools are essential for:

    a) Enhancing data security in translations

    b) Maintaining consistency in technical terms across translations

    c) Automating cultural adaptation of texts

    d) Real-time voice translations

5. A user-friendly interface in translation tools is characterized by:

    a) Complex navigation menus

    b) Minimal training requirements and intuitive design

    c) Advanced hardware integration

    d) Mandatory installation of multiple plug-ins

6. What is the primary role of quality assurance features in translation tools?

    a) To replace human translators

    b) To detect errors and ensure consistency

    c) To translate complex texts automatically

d) To integrate multimedia content

7. Which of the following is a challenge faced by translation tools?

a) Automating repetitive tasks

b) Handling cultural and contextual nuances accurately

c) Reducing the cost of translations

d) Increasing translation speed

8. Ethical considerations in using translation tools include:

a) Improving translation speed

b) Protecting data privacy and security

c) Using advanced user interfaces

d) Reducing manual intervention

9. What is one of the future trends in translation tools?

a) Manual-only translation methods

b) Integration of augmented reality (AR) and virtual reality (VR)

c) Use of translation tools only in academic settings

d) Elimination of translation memory features

10. How do translation tools enhance collaboration in multilingual projects?

a) By replacing translators with AI

b) By offering centralized databases for shared resources

c) By limiting the number of translators involved

d) By simplifying manual document handling

15.5.2 Short Answer Questions

1. Briefly explain the three primary types of translation tools and their main functionalities.
2. What is translation memory, and how does it contribute to consistency in translation projects?
3. List two key quality assurance features in translation tools and describe their importance.
4. Mention two challenges faced when using translation tools and explain their impact on the translation process.
5. Identify two emerging trends in translation tools and discuss how they are likely to shape the future of translation.

15.5.3 Long Answer Questions

1. Discuss the role of translation memory (TM) and terminology management in improving the quality and efficiency of translations.
2. Analyse the importance of a user-friendly interface and efficient navigation in translation tools. How do these features enhance productivity and ease of use for translators?
3. Explain the role of quality assurance features in translation tools.

15.6 Suggested Learning Resources

Bassnett, Susan. *Translation Studies.* 4th ed., Routledge, 2014.

Bowker, Lynne. *Computer-Aided Translation Technology: A Practical Introduction.* University of Ottawa Press, 2002.

Chan, Sin-Wai. *Translation and Translation Technology: A Guide.* The Chinese University Press, 2017.

García, Ignacio. *The Routledge Course in Translation Technology.* Routledge, 2017.

Kuhiwczak, Piotr, and Karin Littau, editors. *A Companion to Translation Studies.* Multilingual Matters, 2007.

Munday, Jeremy. *Introduction to Translation and Interpreting Studies.* Routledge, 2016.

Newmark, Peter. *A Textbook of Translation.* Prentice Hall, 1988.

Unit 16: Artificial Intelligence

Structure

16.0 Introduction

If you have reached this section of the book, you are already acquainted with extensive computer terminology and a considerable amount about the digital realm. In the previous units, we have discussed computers and the plethora of tasks they perform in today's world. One such addition to the list is Artificial Intelligence. This has emerged as the "it" word and is having a big impact on people's lives, integrating seamlessly in everyday tasks. Let us dive into the world of this new technology on the block.

Artificial intelligence (AI) is a term that is used to describe computer systems that are capable of doing complex activities that were previously only feasible for people to accomplish. These activities include learning, thinking, problem solving, interpreting natural language, observing the surroundings, and even demonstrating creativity. Such machines are considered 'intelligent'.

Google Cloud defines AI as "a field of science concerned with building computers and machines that can reason, learn, and act in such a way that would normally require human intelligence or that involves data whose scale exceeds what humans can analyze."

Artificial intelligence (AI) is an extensive domain that includes several subfields, such as computer science, data analytics, statistics, hardware and software engineering, languages, neurology, philosophy, and psychology. AI's objective is not only to replicate human intellect but to improve and expand our capabilities in ways that are safe, ethical, and useful.

For business purposes, artificial intelligence comprises a collection of technologies mostly founded on machine learning and deep learning. These technologies are employed for data analysis, forecasting, object classification, natural language processing, recommendations, intelligent data retrieval, and more applications. AI systems employ enormous amounts of data and complicated algorithms to mimic features of human thought and adapt to new inputs, making them useful in applications ranging from virtual assistants to medical diagnostics.

16.1 Objectives

Objectives of this Unit are as follows:

- Explain the fundamentals of AI
- Trace the historical development of AI
- Explain how AI works
- Demonstrate applications of AI
- Evaluate ethical and societal implications of AI
- Envision the future of AI and its impact

16.2 Artificial Illustration

16.2.1 History of AI

Artificial Intelligence (AI) has been around for quite some time, and its history is a fascinating trip that spans several decades. This is a reflection of humanity's unquenchable curiosity and aspiration to develop robots that are capable of thinking, reasoning, and problem-solving in the same way that people are. Throughout the history of artificial intelligence (AI), there have been several eras, each of which has been characterised by key milestones, hypotheses, and discoveries. This part will discuss these eras, which will provide you with an easy-to-understand description of the development of artificial intelligence.

a. Early Foundations (1940s - 1950s)

The idea that robots could imitate human intellect stretches back to ancient stories and beliefs; nevertheless, it wasn't until the middle of the 20th century that artificial intelligence (AI) started to take shape in a meaningful way. The growth of artificial intelligence may be attributed to two primary factors:

- **Advances in Mathematics and Logic:** The area of artificial intelligence has its origins in mathematical logic, which was formalised in the 19th century by theorists such as George Boole and Gottlob Frege. These thinkers were responsible for the development of the discipline. Alan Turing, a British mathematician, came up with the idea of a "universal machine" in the 1930s. This machine would be able to carry out any mathematical computation that could possibly be conceived of, provided that it could be written as an algorithm. For digital computers and artificial intelligence, Turing's concepts were the cornerstones.

- **The Advent of Computers**: The invention of electrical computers in the 1940s made it possible to conduct complicated computations by providing the physical gear that was not before available. The first computers were cumbersome, sluggish, and restricted in their capabilities; nonetheless, they were strong enough to demonstrate the ability to solve fundamental problems. Early research into artificial intelligence was inspired by scientists like Turing and others who hypothesised that computers might be trained to demonstrate intelligence.

b. The Birth of AI as a Field (1956)

In 1956, John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon organised the Dartmouth Workshop in Hanover, New Hampshire, United States, which is considered to be the beginning of artificial intelligence as a well-established field of study. It was during this conference that the term "Artificial Intelligence" was put up for the very first time to characterise computers that had cognitive capacities comparable to those of humans. During this workshop, a group of researchers put out the idea that "every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it."

Subsequent to this workshop, much research was undertaken in the domains of natural language processing, logic, and machine learning. In the initial stages of artificial intelligence research, the predominant emphasis was on the development of symbolic AI, wherein knowledge and problem solving were represented through rules and symbols.

c. The Golden Era of AI Research (1956 - 1970s)

The field of artificial intelligence had a period of rapid expansion after the Dartmouth Conference. Proving theorems, solving algebraic problems, and even playing games like chess and checkers at astonishing levels were all things that researchers were able to accomplish with their computer systems.

- **Logic Theorist (1955-1956):** Logic Theorist was one of the first artificial intelligence systems, meant to replicate human thinking and capable of proving mathematical theorems. It was created by Allen Newell and Herbert A. Simon.

- **General Problem Solver (1957):** This software, which was also built by Newell and Simon, had the ability to solve issues in a manner that was comparable to the ways that humans use to solve problems. The creation of a general-purpose artificial intelligence was one of the earliest attempts made.

- **ELIZA (1966):** The computer software known as ELIZA was developed by Joseph Weizenbaum in 1966. It was capable of simulating human communication to a certain extent. It was a demonstration of the potential of natural language processing and a precursor to the creation of chatbots, despite the fact that ELIZA's replies were based on a straightforward set of rules.

In spite of the excitement, artificial intelligence research was constrained by the processing power and storage capacities that were available at the time. Earlier instances of artificial intelligence were mostly "toy" versions that were unable to deal with the intricacies of real-world applications.

d. The First "AI Winter" Period (1970s - 1980s)

By the 1970s, it had become abundantly evident that artificial intelligence was a more difficult endeavour than was initially believed. The researchers encountered challenges while attempting to scale up AI systems such that they could function reliably in real-world scenarios. The limits of the field, in conjunction with the reduction in funding, resulted in a time that came to be known as the AI Winter. Governments and businesses lost interest in sponsoring artificial intelligence research, which resulted in a significant slowdown in progress.

During this time period, a significant number of researchers moved their attention to fields like expert systems and knowledge representation, which presented more opportunities for application in business environments. Expert systems, such as MYCIN, a medical diagnosis tool, utilised specialised knowledge to make judgements, demonstrating that artificial intelligence is capable of efficiently solving issues that are particular to a domain.

e. The Rise of Machine Learning and Second AI Boom (1980s - 1990s)

In the 1980s, there was a rise in research into artificial intelligence (AI). This was due to better computers and new methods, especially machine learning. Machine learning lets computers learn from data instead of being designed with rules that they already know.

- **Neural Networks:** Although neural networks, which were modelled after the organisation of the human brain, had been the subject of research since the 1950s, it wasn't until the 1980s that they received a significant amount of attention. New approaches to training neural networks were created by researchers such as Geoffrey Hinton and Yann LeCun, which led to early achievements in the fields of pattern recognition and image processing.

- **Expert Systems:** With the rise of corporate settings, expert systems have become increasingly prevalent. Automating decision-making, diagnosing equipment issues, and optimising processes are all examples of how artificial intelligence has been utilised by businesses to demonstrate its promise for practical applications.

- **The Fifth Generation Computer Project**: An ambitious government initiative to construct supercomputers with artificial intelligence capabilities was initiated in Japan in 1982. This project was known as the Fifth Generation Computer Initiative. This project had the intention of ushering in a new era of computing, but in the end, it was not successful in accomplishing its lofty objectives. On the other hand, it rekindled interest in artificial intelligence research all around the world and inspired similar efforts all over the world.

f. The Internet Age and the Rise of Big Data (2000s)

Artificial intelligence underwent a period of profound change throughout the 2000s, which was fuelled by the advent of the internet and the huge amounts of data that it created. As the number of actions that took place online increased, enormous volumes of data became accessible, which opened up new possibilities for machine learning.

- **Data-Driven Machine Learning:** If researchers had access to large amounts of data, they would be able to design machine learning algorithms that could learn from massive datasets, therefore enhancing their accuracy and dependability. Computer vision, natural language processing, and recommendation systems experienced substantial progress due to this transformation.

- **Support Vector Machines (SVM) and Decision Trees:** New machine learning models such as SVMs and decision trees enabled for more accurate predictions and classifications,

which expanded the capabilities of artificial intelligence in a variety of applications, ranging from email spam filters to medical diagnostics.

g. Revolutionary Deep Learning and Contemporary AI (2010s to Present)

Deep learning, a more sophisticated version of neural networks that is capable of performing complicated tasks with a precision that has never been seen before, was the primary force behind the contemporary era of artificial intelligence, which began in the 2010s. Image identification, language translation, and game playing are just a few of the industries that have been revolutionised by deep learning.

- **DeepMind's AlphaGo (2016)**: AlphaGo, developed by Google DeepMind, achieved a significant victory against Lee Sedol, the reigning world champion Go player, in the year 2016. This victory was a watershed event. The game of Go is a complex board game with more potential moves than the number of atoms in the universe. The victory of AlphaGo showcased artificial intelligence's capability to tackle very challenging tasks.

- **Advances in Natural Language Processing:** Systems like GPT-3, BERT, and ChatGPT have brought about a revolution in natural language processing. These advancements make natural language processing more advanced. In order to demonstrate the capability of language models in a variety of applications, ranging from customer service to education, these artificial intelligence models are able to create text, provide answers to enquiries, and even compose essays.

- **AI in Everyday Life:** Personalised suggestions on platforms such as Netflix and YouTube are examples of how artificial intelligence is now being incorporated into our everyday lives. Virtual assistants such as Siri and Alexa are examples of how AI is currently being used. Advanced artificial intelligence algorithms are necessary for the operation of autonomous cars, face recognition technology, and smart home gadgets.

16.2.2 How AI Works

Artificial intelligence functions through an integration of machine learning, neural networks, natural language processing, data, algorithms, and sophisticated hardware. Comprehending these components offers an extensive perspective on the mechanisms by which AI systems acquire knowledge, adjust, and execute tasks that replicate human intellect.

1. Machine Learning

Machine learning is a branch of artificial intelligence that allows computers to autonomously acquire knowledge from data and enhance their performance over time without explicit programming.

It relies on algorithms to discern patterns, render choices, and forecast consequences. There exist three primary categories of machine learning:

- **Supervised Learning:**
  - **Definition:** Supervised learning is the process where the AI system is trained on a labelled dataset, which implies that each training sample has an output label. The system learns to map inputs to outputs and make predictions or classifications using previously unknown data.
  - **Examples:** Image recognition, spam email filtering, and medical diagnosis.
  - **Process:** The procedure involves feeding the model input-output pairs and letting it understand the relationship between them. Once trained, the model reliably predicts the outcome of new inputs.

- **Unsupervised Learning:**
  - **Definition:** In unsupervised learning, the AI system is given data but no clear instructions on what to do with it. The system recognises patterns, correlations, or structures in the data on its own.
  - **Examples:** Clustering (e.g., customer segmentation), anomaly detection, and recommendation systems.
  - **Process:** The process involves algorithms that attempt to group data based on similarities or differences without predefined labels. Techniques like clustering and dimensionality reduction are often used.

- **Reinforcement Learning:**
  - **Definition:** When AI uses reinforcement learning, it learns by communicating with the world around it. It does things, watches what happens, and gets feedback in the form of awards or punishments.
  - **Examples:** Game playing (e.g., AlphaGo), robotics, and autonomous driving.
  - **Process:** The process involves the system exploring different actions and learning a policy that maximises cumulative rewards over time. It uses trial and error to discover which actions yield the best results.

2. Neural Networks and Deep Learning

Neural networks are computational models inspired by the architecture of the human brain. They consist of nodes (neurons) connected together that transmit and receive information. Deep

learning, a subset of machine learning, employs multilayered neural networks to analyse and interpret complex data.

- **Neural Networks:**
  - **Structure:** You can find an input layer, one or more buried layers, and an output layer in a neural network. Each neurone takes in information, processes it, and then sends it to the next layer.
  - **Activation Function:** Activation functions (such as sigmoid and ReLU) tell neurons what to do with the information they receive.
  - **Training:** A method called backpropagation is used to teach neural networks. In this method, mistakes are sent backwards through the network and weights are changed to reduce the error..
- **Deep Learning:**
  - **Definition:** Deep learning is a form of machine learning that entails training artificial neural networks with numerous layers to identify patterns in huge datasets.
  - **Examples:** Speech recognition, image classification, and natural language processing.
  - **Process:** Deep learning models need substantial quantities of data and processing resources. They employ methodologies such as convolutional neural networks (CNNs) for image analysis and recurrent neural networks (RNNs) for sequential data.

3. Natural Language Processing (NLP)

Natural Language Processing (NLP) is a domain of artificial intelligence that examines the interaction between computers and humans through natural language. Natural language processing enables machines to comprehend, analyse, and generate human language.

- **Techniques:** NLP methodologies encompass tokenisation, part-of-speech tagging, named entity identification, sentiment analysis, and machine translation.
- **Applications:** Chatbots, language translation services (e.g., Google Translate), and voice assistants (e.g., Siri, Alexa).
- **Challenges:** NLP encounters difficulties stemming from the intricacies and ambiguities of human language, encompassing context, colloquialisms, and idiomatic expressions.

4. Data and Algorithms

Data is what makes AI programs work. AI needs a lot of information to learn and make smart choices. The math models and steps that handle this data and make learning happen are called algorithms.

- **Data Collection:** Data is gathered from a wide variety of sources, including as sensors, databases, and the activities of users.

- **Data Preprocessing:** Data needs to be cleaned and preprocessed to get rid of noise and errors before it can be fed into AI models. To do this, you need to do things like normalisation, scaling, and feature extraction.

- **Algorithms:** Algorithms determine how data is processed and learned. Decision trees, support vector machines, linear regression, and deep learning models are all common types of algorithms.

5. Computational Power and Hardware

To build and run complicated models, AI needs a lot of computing power. Hardware improvements, such as graphics processing units (GPUs) and tensor processing units (TPUs), have sped up the growth of AI.

- **GPUs and TPUs:** Graphics Processing Units (GPUs) are dedicated hardware optimised for parallel processing, rendering them suitable for training deep learning models. TPUs are specifically engineered by Google to enhance AI calculations.

- **Distributed Computing:** Distributed computing involves using multiple machines to share the computational load, enabling faster training of large models.

To put it another way, artificial intelligence functions by integrating massive data sets with processing algorithms that are intuitive. Artificial intelligence is able to influence these algorithms by inferring patterns of behaviour within the data set. One must be aware that artificial intelligence is not comprised of a single algorithm. Instead, it is a comprehensive machine learning system that is able to solve issues and make recommendations on outcomes.

Let us take a detailed look at how artificial intelligence operates:

- **Data Collection:** The initial stage of artificial intelligence is the input. During this stage, the programmer or operator gathers the data that is required for artificial intelligence to function effectively. It is not necessary for the data to be submitted in the form of text; it can instead be in the form of images or audio. However, it is essential to make certain that the algorithms

are able to read the data that is input. In addition, it is essential to precisely identify the context of the data as well as the outputs that are wanted during this stage.

- **Data Processing and Cleaning**: Often raw data includes noise or pointless information. Data cleaning guarantees consistent and reliable data by removing this noise. During the processing phase, artificial intelligence (AI) looks at the pre-programmed data and uses the habits it has learnt to find ones that are the same or similar in real-time data. This is specific to the AI technology that is being utilised.

- **Model Training**: This is the most important aspect of the learning process for AI. The AI system makes use of data in order to adapt itself so that it can recognise patterns and make predictions as it is being trained. The procedure entails entering data into an algorithm, which then makes an attempt to recognise rules or correlations that are included within the data collected. Artificial intelligence is able to learn and enhance its performance as a result of this occurring several times. If the data set results in a failure, artificial intelligence technology has the ability to learn from the error and perform the procedure in a new manner. The rules of the algorithms might need to be modified or altered in order to accommodate the data set. There is also the possibility that outcomes will change throughout the adjustment phase in order to reflect a more desirable or suitable conclusion.

- **Evaluation and Testing**: Following the training process, a model is put to the test on brand-new data to see how well it does. This step is very important for checking if the AI can correctly guess or decide what to do. In addition, it is able to offer feedback that is both essential and beneficial prior to running the algorithms once again. If the model doesn't do well, it might need more training or a newly designed method.

- **Deployment**: Once the model has been validated and improved, it is prepared to be utilised in applications that are based in the real world. The step known as "deployment" is the stage in which artificial intelligence is incorporated into software or systems that humans may utilise. For example, a virtual assistant driven by artificial intelligence, such as Meta AI (available in WhasApp), is able to communicate with users after it has been deployed.

Check your progress:
1. *True or False:* Artificial intelligence systems can learn and improve from past experiences without being explicitly programmed.

16.2.3 Applications of AI

Artificial intelligence has brought about a revolution in a wide range of sectors by making it possible for computers to carry out activities that would normally need the intelligence of a human being. By enhancing productivity, accuracy, and decision-making processes, artificial intelligence is causing a transformation across a variety of sectors. These are some of the most powerful uses of artificial intelligence in many different fields:

1. **Healthcare**

    ● **Medical imaging:** X-rays, CT scans, and magnetic resonance imaging (MRI) are examples of medical pictures that may be analysed by artificial intelligence algorithms to detect illnesses like cancer at an earlier stage. For instance, DeepMind, which is a subsidiary of Google, has created artificial intelligence algorithms that are capable of accurately diagnosing eye illnesses based on retinal scans.

    ● **Personlised medicine:** Artificial intelligence has the ability to analyse patient data and provide recommendations for personalised treatment strategies. IBM's Watson for Oncology is an example of an application of artificial intelligence that offers oncologists treatment alternatives that are supported by evidence.

2. **Finance**

    ● **Fraud detection:** Artificial intelligence systems are able to monitor transactions in real time in order to identify fraudulent activity. Banks can better avoid fraud by utilising machine learning models, which analyse trends and identify behaviour that is not typical.

    ● **Algorithmic trading:** Using artificial intelligence, algorithms can execute trades at high speed and volume by analysing market data and patterns. This type of trading is known as algorithmic trading. Hedge funds and other financial firms are utilising artificial intelligence to improve their trading tactics.

3. **Transportation**

    ● **Autonomous vehicles:** AI is the foundation of autonomous vehicles, which enables them to navigate roadways, understand traffic signals, and avoid obstacles. Autonomous vehicles are becoming increasingly popular. Autonomous driving technology is being developed by companies such as Tesla and Waymo, who are at the forefront of the industry.

- **Traffic management:** In the field of traffic management, artificial intelligence may analyse traffic data to improve the timing of traffic lights and minimise congestion. For the purpose of enhancing urban mobility, intelligent traffic management systems are now being introduced in cities.

4. Retail

- **Recommendation Systems:** Artificial intelligence is used by e-commerce platforms such as Amazon and Netflix to make product and content recommendations to consumers based on their browsing experiences and previous purchases. The user experience is improved by these recommendation algorithms, which also boost sales further.

- **Inventory management:** Artificial intelligence has the ability to forecast the demand for items and optimise inventory levels, hence cutting down on waste and increasing efficiency. AI is being used by retailers to improve the efficiency of their supply chain management.

5. Education

- **Personalised learning:** The use of artificial intelligence allows for the creation of personalised learning strategies for pupils, taking into account both their strengths and deficiencies. AI is used by platforms such as Khan Academy and Coursera to offer courses and resources to students who are interested in learning.

- **Automated Grading:** Artificial intelligence has the ability to assess essays and tasks, providing students with rapid feedback. This enables educators to devote more of their attention to teaching and less to administrative responsibilities.

6. Customer service

- **Chatbots:** Using artificial intelligence, chatbots are able to manage client enquiries and give help around the clock. Chatbots are being used by businesses to better satisfy their customers and decrease the amount of labour that is required of human agents.

- **Sentiment analysis:** Artificial intelligence has the ability to analyse consumer feedback and social media posts in order to determine how the general public feels about a certain company. As a result, businesses are better able to meet the requirements of their customers and enhance the quality of their output.

7. Agriculture

- **Precision farming:** With the help of artificial intelligence, farmers can monitor the health of their crops and optimise watering and fertilisation by analysing data collected from sensors and drones. Artificial intelligence is being used by farmers to boost agricultural production while simultaneously lowering resource use.

- **Predictive analysis:** The application of artificial intelligence to forecast meteorological conditions and insect infestations is known as predictive analytics. This enables farmers to make more informed decisions on planting and harvesting.

8. Manufacturing

- **Predictive maintenance:** Artificial intelligence has the ability to anticipate faults in equipment before they take place, which enables proactive maintenance to be performed. There is a reduction in downtime and an increase in productivity when manufacturers adopt AI.

- **Quality control:** Vision systems that are powered by artificial intelligence are able to examine things for flaws with a high degree of precision. This guarantees that only items of superior quality are released onto the market.

Let us now see how we as learners can access AI and utilise its ever-increasing potential.

Here are some examples of AI tools currently making an impact across different fields:

1. **ChatGPT** by OpenAI – A conversational AI for generating human-like responses, helping with tasks such as answering questions, drafting emails, and providing general assistance. Try this AI app at chatgpt.com.
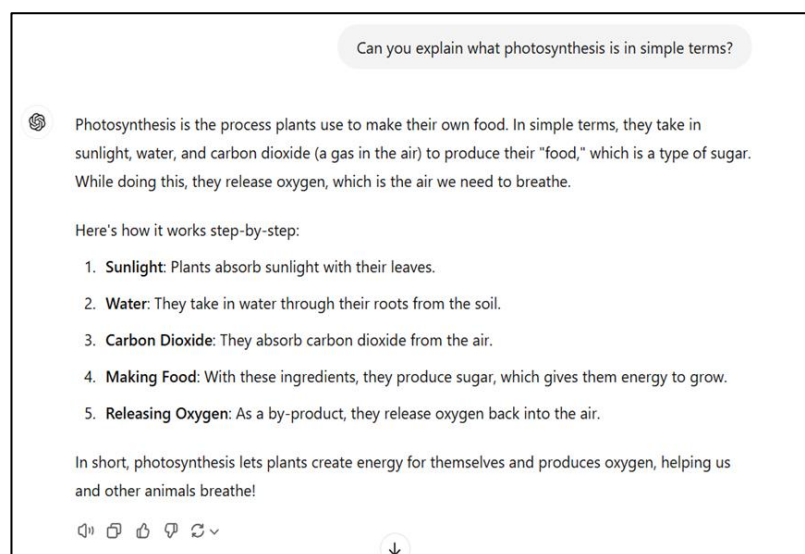
Fig: 16.1 Illustration of a prompt and response from ChatGPT

2. **Meta AI** by Meta – An AI system used in Facebook and Instagram to enhance user experience by recommending content, detecting and reducing harmful content, and supporting language translations. This AI is integrated with WhatsApp as well. However, the example you see next is from the web version of Meta. Find it at www.meta.ai.
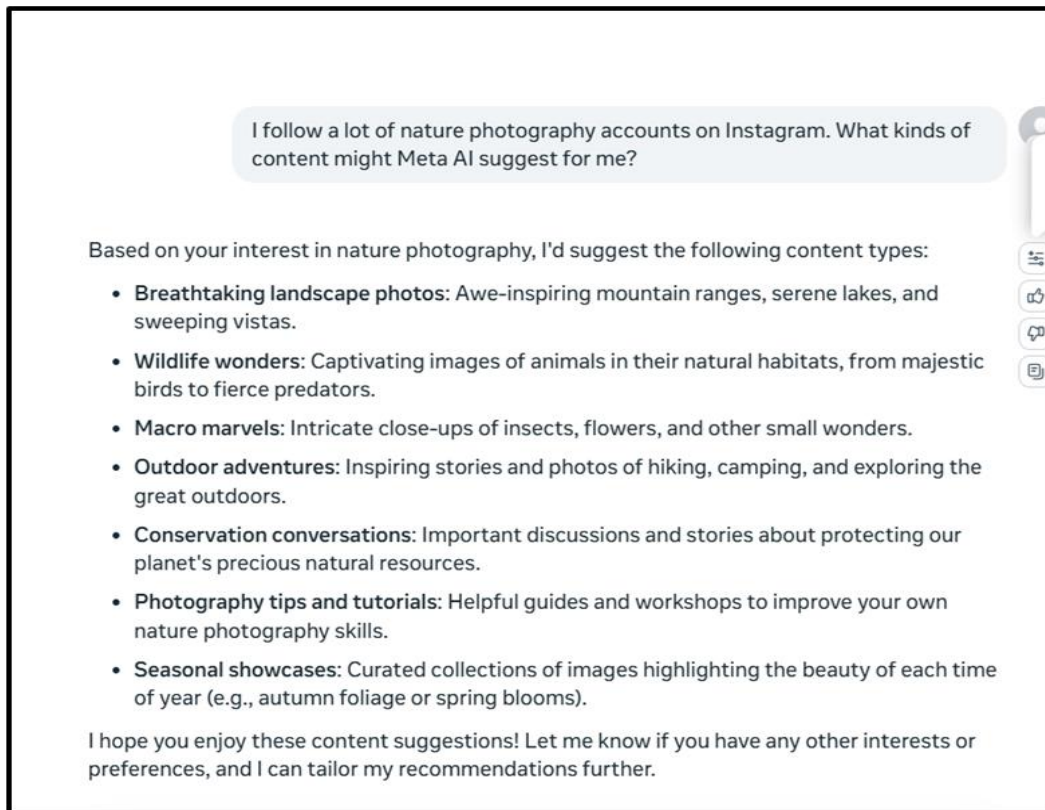
Fig: 16.2 *Illustration of a prompt and response from Meta AI*

3. **Gemini** by Google DeepMind – An advanced AI model integrating multimodal capabilities for applications in language understanding, image generation, and specialised tasks like scientific research assistance. Use this AI tool at gemini.google.com.

Fig: 16.3 : *Illustration of a prompt and response from Gemini*

4. **Copilot** by Microsoft – An AI-powered assistant integrated into Microsoft 365 apps to boost productivity and creativity by automating tasks, generating content, and providing intelligent suggestions. Find it at copilot.microsoft.com

5. **Nightcafe** – A creative AI that generates images from text prompts, used for artwork, visual content, and concept design.

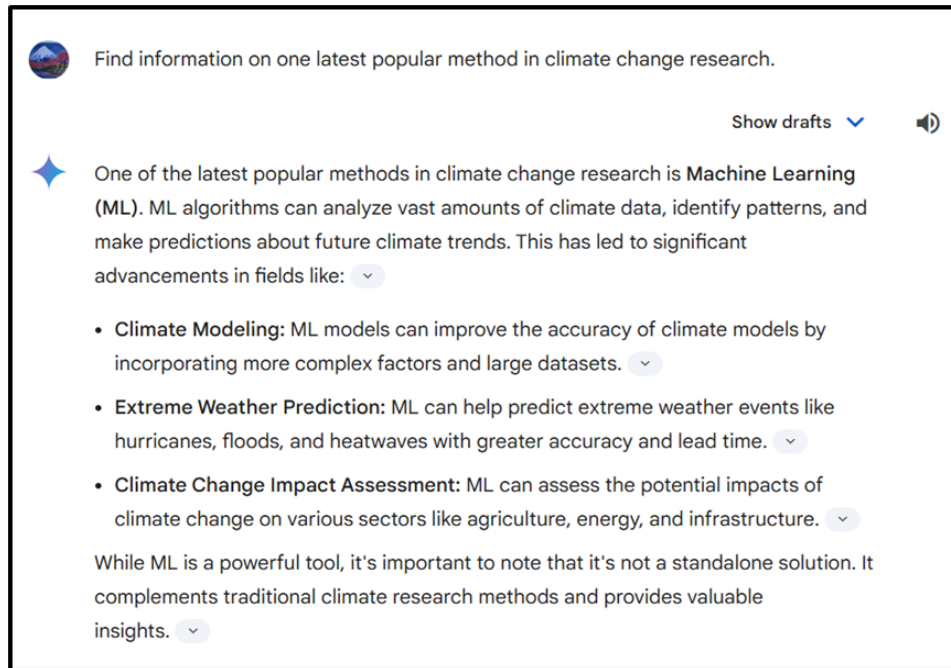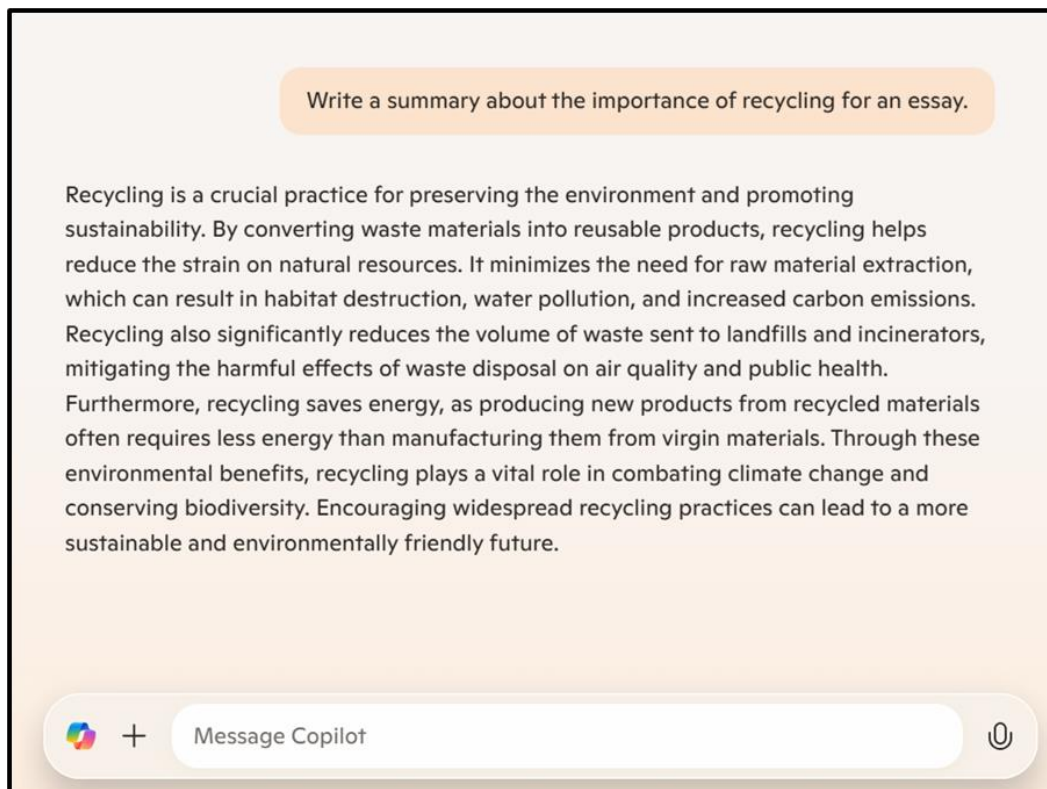Prompt: A hanging garden with pink, purple and yellow flowers on a floating island

Fig 16.5: Illustration of a prompt and response from Nightcafe

These were only some of the many ways AI can be used. Artificial intelligence (AI) applications such as ChatGPT, Microsoft Copilot, and Gemini can be of considerable assistance to students in improving their learning experience and increasing their productivity. Learners can use ChatGPT as a virtual study partner to assist them in answering questions, explaining difficult topics, and coming up with ideas for projects or essays. It has the ability to simplify difficult subjects and deliver prompt feedback, which makes it particularly suitable for training sessions that are focused on rapid learning and revision. Students may save time and experience less stress when working on assignments by using Microsoft Copilot, which provides support in apps such as Word and Excel. This support helps students summarise research, generate reports, and organise data, all of which aid students in completing their projects. Gemini by Google DeepMind, on the other hand, functions as a sophisticated research assistant, assisting students in locating credible sources, summarising academic information, and keeping themselves updated on the most recent advancements in their respective professions. Through the use of AI-driven support and coaching, these technologies have the potential to revolutionise learners' study habits, expedite workflows, and assist students in developing a more profound grasp of the subjects they are studying.

16.2.4 Ethical and Societal Implications

There are a number of ethical and societal concerns that are raised by artificial intelligence (AI), such as the possibility of bias and discrimination in algorithms, losing jobs, having privacy invaded, not being able to see how decisions are made, and the chance of abusing for bad reasons. To make sure that AI is used in a reasonable and helpful way, careful development and regulation are required. Here are some key considerations:

1. **Privacy and Data Security**

- **Data Collection:** The collection of data: In order to work properly, many artificial intelligence technologies require access to a substantial quantity of user data. A result of the fact that this data frequently contains private and sensitive information, issues regarding privacy are raised. For the purpose of protecting the privacy of users, it is vital to make certain that AI apps manage this data in a secure and transparent manner.

- **User consent:** Users may not always be entirely aware of what data is being gathered or how it is being used; therefore, it is important for them to provide their consent. It is possible for unintended data exploitation and misuse to occur as a result of this lack of informed permission.

2. **Bias and Fairness**

- **Algorithmic bias:** Artificial intelligence systems have the potential to unintentionally reflect and even exacerbate biases that are inherent in their training data. It is possible that this may result in certain groups being treated unfairly, whether it be in terms of recruiting, admission, or content suggestions. In the event that an artificial intelligence tool is trained on biased data, for instance, it may generate findings that reinforce preconceptions or ignore the opinions of minority groups.

- **Equity in access:** Because artificial intelligence (AI) tools are becoming increasingly widespread in education and other fields, there is a possibility that the digital gap could grow even more pronounced. As a result of limited access to technology, students and communities may be unable to reap the benefits of artificial intelligence, which may exacerbate existing inequities.

3. **Impact on Employment and Skills**

- **Job displacement:** There is a possibility that certain operations may be automated, which might result in job losses in industries where artificial intelligence is capable of

performing repetitive or standardised labour effectively. Students who are going to enter the workforce need to learn abilities that are difficult for artificial intelligence to reproduce, such as the ability to think critically, be creative, and communicate effectively with others.

- **Skill development:** Although artificial intelligence tools have the potential to simplify tasks like writing, coding, or research, there is a risk that students may be unable to acquire important skills if they rely too much on these tools. In order to ensure that students acquire well-rounded capabilities, it is critical to create a balance between AI and traditional learning approaches.

4. **Academic Integrity and Misuse**

- **Cheating and plagiarism:** The use of artificial intelligence to produce material, such as essays or responses to assignments, might make it simpler for students to hand in work that is not their own. This can lead to instances of cheating and plagiarism. This can be detrimental to the integrity of the academic process and make it more challenging for teachers to evaluate the students' level of comprehension.

- **Learning dependence:** Students may be hindered in their ability to have autonomous critical thinking and problem-solving abilities, which are essential for both personal and academic development, if they rely too heavily on artificial intelligence for their studying and assignments.

5. **Transparency and Accountability**

- **Explainability:** Many artificial intelligence systems, particularly deep learning models, function as "black boxes," which literally means that their decision-making processes are difficult to understand and frequently not transparent. Because of this lack of explainability, it can be difficult to trust and comprehend the results that artificial intelligence produces, particularly in sensitive fields such as health or finance.

- **Responsibility for mistakes:** When artificial intelligence tools create outputs that are wrong or harmful, it can be difficult to determine who is accountable for such outputs (the developers, the user, or the organisation that is deploying the AI). This can sometimes result in accountability gaps.

6. Impact on Human Interaction and Social Skills

- **Social Isolation:** Research suggests that increased involvement with artificial intelligence technologies, such as virtual companions, may result in a reduction in

human-to-human connection, which may have implications for social development, particularly in younger individuals.

- **Dependence on Technology:** When individuals rely excessively on artificial intelligence tools for their day-to-day activities, they may become reliant on technology, which may impair their capacity to remain resilient and adaptable in circumstances when AI may not be available or appropriate.

16.2.5 Future of AI

We have seen in a few examples the potential AI has and how seamlessly it is integrating into our lives. AI has huge future possibilities as well as interesting problems. Rather than replacing human capacities, artificial intelligence is supposed to progressively increase them. In many different disciplines, tools like Microsoft Copilot and ChatGPT will become indispensable allies helping experts with activities including creative processes, data analysis, and writing. The emphasis will be on designing systems that improve output and decision-making, fostering a cooperative interaction between people and machines. Through the use of artificial intelligence's capabilities, this cooperation will enable people to keep control over critical thinking and creativity while nevertheless leveraging them, therefore producing better results in several sectors.

Apart from improved cooperation, artificial intelligence will keep developing in its capacity to offer customised experiences in many other fields. The system will compile and evaluate personal preferences and behaviours, therefore producing ever more pertinent recommendations and answers. From unique purchasing experiences in retail to tailored learning opportunities in education, the personalising pushed by artificial intelligence will transform how people engage with technology. Users will experience a degree of customisation that fits their own wants and tastes as artificial intelligence systems get more complex, therefore facilitating more fulfilling and successful interactions.

Natural Language Processing (NLP) is poised to make major progress, thereby enhancing human language creation and comprehension. This advancement will enable improved human-machine communication, hence enabling more smooth and simple interactions. More lifelike discussions, context, emotions, and language subtleties might be enabled by future artificial intelligence systems. Engaging in human-like conversation will provide artificial intelligence applications in customer service, education, and healthcare provide opportunities for enhancement of user experiences and outcomes.

Since artificial intelligence is included in commonplace goods and services, it will also become even more entwined with daily life. From personal assistants helping to manage calendars and improve productivity to smart home technology automating daily chores, artificial intelligence will simplify many facets of life and produce more effective living environments. Along with increasing ease, this connection will enable people to make better decisions grounded on real-time data and insights. Users will probably enjoy better quality of life and higher general productivity as artificial intelligence becomes a mainstay of daily activities.

Within the healthcare industry, artificial intelligence is expected to transform predictive analytics, tailored treatment plans, and diagnosis tools. AI-driven imaging and data analysis, among other technologies, will improve illness identification and management, hence improving patient outcomes. The evolution of artificial intelligence in clinical trials and drug development will hasten medical progress and equip doctors and researchers with potent instruments to raise patient care. AI will be more important in tackling issues including accessibility, efficiency, and medical service efficacy as it develops in healthcare.

The need for ethical issues will grow as artificial intelligence spreads across society. Developing open, fair, and responsible artificial intelligence systems will take centre stage. Initiatives will probably centre on reducing prejudice, safeguarding privacy, and making sure artificial intelligence advances all spheres of life. Guiding the responsible use of artificial intelligence and guaranteeing that technologies are created and used in ways that respect individual rights and advance societal good will depend critically on the evolution of ethical norms and frameworks. This focus on ethical artificial intelligence will assist in establishing confidence among consumers and stakeholders, therefore promoting a cooperative environment in which artificial intelligence may flourish.

Furthermore, changing employment will be artificial intelligence and automation. Automation may cause some occupations to be replaced, but it will also provide new prospects needing sophisticated knowledge in artificial intelligence management, development, and monitoring. In a changing employment environment, lifelong learning and adaptation will become absolutely vital for professional success. Workers will need to improve their skill sets as companies use artificial intelligence technology, thereby stressing the need for education and training programs that equip people with the tools they need to negotiate this change.

Personalising education, offering real-time feedback, and building adaptable learning environments that meet particular student requirements will all depend critically on artificial intelligence. Intelligent tutoring systems will help educators and improve the student learning

environment. Teachers may create more successful teaching plans that fit the particular learning styles of their pupils by using the possibilities of artificial intelligence, therefore creating a more inclusive and encouraging classroom.

Furthermore, artificial intelligence can help to solve major worldwide problems, including food security, healthcare accessibility, and climate change. Data analysis and predictive modelling will guide policy decisions and assist in developing workable answers to urgent problems. Governments and businesses may cooperate to apply methods addressing these issues by using artificial intelligence, therefore fostering a more sustainable and fair future for all.

All things considered, artificial intelligence has bright future prospects, as developments will probably enhance many facets of life, employment, and society. These developments will, however, demand serious thought of ethical consequences and a dedication to guarantee responsible development and application of artificial intelligence technology. A future where artificial intelligence serves the greater good will be shaped by the cooperation among engineers, legislators, teachers, and the public, thereby improving human potential and tackling some of the most urgent problems of our day.

16.2.6 Let Us Sum Up

A computer system that can do complicated jobs that people used to be the only ones who could do them is said to have artificial intelligence (AI). Some of these things are learning, thinking, solving problems, understanding common language, watching the world around you, and even being creative. Artificial Intelligence encompasses several domains, including computer science, data analytics, statistics, hardware and software engineering, languages, neurology, philosophy, and psychology.

AI has been around for a long time. Its growth can be mainly credited to two things: progress in math and logic, which was defined by philosophers like Gottlob Frege in the 1800s, and the invention of computers in the 1940s. A lot of the early work on artificial intelligence came from scientists like Turing and others who thought computers could be taught to act smart.

The Dartmouth Workshop, which happened in 1956, was the first place where the word "Artificial Intelligence" was used to describe computers that could think and reason like people. At this meeting, researchers said that they could describe every part of learning or any other aspect of intelligence so exactly that a machine could be made to mimic it. The field of artificial intelligence experienced rapid expansion after the Dartmouth Conference, with early attempts to replicate human

thinking and solve problems. Logic Theorist, General Problem Solver, and ELIZA were some of the first AI systems created, but their development was constrained by processing power and storage capacities. Neural networks, modelled after the organisation of the human brain, gained attention in the 1980s, leading to early achievements in pattern recognition and image processing. Expert systems have become increasingly prevalent in corporate settings, automating decision-making, diagnosing equipment issues, and optimising processes. The Fifth Generation Computer Project in 1982 aimed to construct supercomputers with artificial intelligence capabilities, but it was not successful in accomplishing its lofty objectives. The Internet Age and the Rise of Big Data in the 2000s led to profound changes in AI, with data-driven machine learning, support vector machines (SVMs), and decision trees enabling more accurate predictions and classifications.

Deep learning has revolutionised various industries, including image identification, language translation, and game playing. AlphaGo, developed by Google DeepMind in 2016, demonstrated the ability of AI to handle challenging tasks. Advancements in natural language processing, such as GPT-3, BERT, and ChatGPT, have made AI more advanced in various applications. In everyday life, personalised suggestions on platforms like Netflix and YouTube, virtual assistants, and advanced artificial intelligence algorithms are essential for autonomous cars, face recognition technology, and smart home gadgets.

Machine learning, neural networks, natural language processing, data, algorithms, and high-tech devices are all parts of AI that work together. Machine learning lets computers learn from data and get better at what they do over time without any help from humans. One main type of machine learning is supervised learning. The other two are uncontrolled learning and reinforcement learning. Neural networks are computational models inspired by the architecture of the human brain. They consist of interconnected nodes that process and transmit information. Deep learning is a kind of machine learning that use multilayered neural networks to analyse and interpret extensive datasets. Speech detection, picture classification, and natural language processing are some examples. Natural word processing, or NLP, is the study of how machines and people can talk to each other using everyday words.

AI has applications in healthcare, finance, transportation, retail, education, agriculture, and manufacturing. Medical imaging, personalised medicine, fraud detection, traffic management, recommendation systems, inventory management, education, and customer service are some of the most powerful uses of AI. On the other hand, AI raises ethics and social concerns, such as the possibility of bias and discrimination in algorithms, job loss, data breaches, decisions that aren't clear,

and undesirable uses. Careful research and control are needed to make sure that AI is used in a way that is responsible and helpful. Privacy and data protection, user agreement, algorithmic bias, and equal access are some of the most important things to think about.

In conclusion, AI's future holds both potential and challenges. It is essential to strike a balance between AI usage and traditional education to ensure its continued development and impact on society.

16.3 Learning Outcomes

Now that you have completed this Unit, you should be able to:

- Understand the historical evolution of Artificial Intelligence (AI) and its key milestones, tracing its development from inception to modern advancements.
- Explain the working principles of AI, including core concepts like machine learning, neural networks, and decision-making processes.
- Identify diverse applications of AI in fields such as healthcare, education, entertainment, and beyond.
- Critically analyse the ethical and societal implications of AI, including privacy concerns, bias, and the impact on employment.
- Discuss the potential future trends and developments in AI, exploring emerging technologies and their implications for humanity.

16.4 Glossary

- **Artificial Intelligence (AI)**: Artificial Intelligence (AI): The emulation of human cognitive functions in computers designed to think, learn, and execute activities that ordinarily need human intellect.
- **Machine Learning**: Machine Learning: A branch of AI that entails training algorithms to derive insights and make predictions or judgements from data autonomously, without explicit programming.
- **Neural Networks**: Computational models derived from the human brain, with linked nodes (neurons) that process and convey information to execute intricate tasks.

- **Deep Learning:** A subset of machine learning that uses multi-layered neural networks to evaluate and comprehend intricate data, facilitating sophisticated tasks such as image and speech recognition.
- **Algorithmic Trading**: The use of AI algorithms to execute trades at high speed and volume by analysing market data and patterns, commonly used in financial markets.
- **Predictive Maintenance**: The use of artificial intelligence to anticipate equipment faults before their occurrence, allowing proactive maintenance to minimise downtime and enhance productivity in manufacturing and other industries.
- **Data Preprocessing**: The process of cleaning and preparing raw data for analysis by removing noise, normalising, scaling, and extracting relevant features to ensure consistent and reliable input for AI models.
- **Chatbots**: AI-powered programs that simulate human conversation, providing customer service, answering queries, and assisting users through text or voice interactions
- **Recommendation Systems**: The use of Artificial intelligence algorithms by companies such as Amazon and Netflix to recommend items or content to consumers based on browsing history, preferences, and behaviour.
- **Personalised Learning**: The use of artificial intelligence to generate customised educational experiences based on individual students' strengths, limitations, and learning styles, hence increasing teaching efficacy.

16.5 Sample Questions

16.5.1 Objective Questions

1. What is the primary goal of Artificial Intelligence (AI)?

    a. To replace human workers

    b. To replicate and enhance human intelligence

    c. To create faster computers

    d. To develop new programming languages

2. Who is considered one of the pioneers of AI and proposed the concept of a "universal machine"?

    a. Larry Page

    b. Margaret Hamilton

    c. Alan Turing

d. Claude Shannon

3. What was the significance of the Dartmouth Workshop in 1956?

    a. It introduced the first AI computer

    b. It marked the beginning of AI as a well-established field of study

    c. It developed the first neural network

    d. It created the first AI-powered robot

4. Which AI technique is used to analyse and interpret human language?

    a. Neural Networks

    b. Natural Language Processing (NLP)

    c. Deep Learning

    d. Reinforcement Learning

5. What is the main function of recommendation systems in e-commerce platforms?

    a. To manage inventory

    b. To suggest products or content to users based on their preferences

    c. To process payments

    d. To handle customer complaints

6. Which of the following is an example of an AI application in healthcare?

    a. Autonomous vehicles

    b. Fraud detection

    c. Medical imaging analysis

    d. Traffic management

7. What is the primary concern related to the ethical use of AI?

    a. Increasing computational power

    b. Ensuring transparency and fairness in AI systems

    c. Developing faster algorithms

    d. Reducing the cost of AI development

8. Which AI model achieved a significant victory against the world champion Go player in 2016?

    a. Watson

    b. AlphaGo

    c. ELIZA

    d. Deep Blue

9. What is the role of data preprocessing in AI?

a. To collect data from various sources

b. To clean and prepare raw data for analysis

c. To deploy AI models in real-world applications

d. To train neural networks with multiple layers

10. Which of the following is NOT a type of machine learning?

    a. Supervised Learning

    b. Unsupervised Learning

    c. Reinforcement Learning

    d. Predictive Learning

16.5.2 Short Answer Questions

1. Define Artificial Intelligence (AI) and explain its significance in modern society.
2. Describe how neural networks and deep learning contribute to the functionality of AI systems.
3. Explain the types of machine learning with examples.
4. How does the use of AI in education enhance personalised learning experiences for students?

16.5.3 Long Answer Questions

1. Describe the historical development of artificial intelligence from its early beginnings to the present day.
2. Explain the various steps involved in the operation of Artificial Intelligence.
3. Discuss the ethical and societal implications of artificial intelligence.
4. How will you describe the future of AI? Do you think artificial intelligence will continue to make as much an impact as it does today?

16.6 Suggested Learning Resources

Mueller, John Paul, and Luca Massaron. *Artificial Intelligence for Dummies.* Wiley Publishers, India Edition, 2018.

Taulli, Tom. *Artificial Intelligence Basics.* Apress, 2019.

Note: This question paper consists of three parts: Part A, Part B, and Part C. The number of words to answer each question is only indicative. Attempt all parts.

Part A contains 10 compulsory questions of multiple choice/fill in the blank/very short answer type. Answer **all** questions. Each question carries **1** mark.   **(10x1=10 marks)**

Part B contains 8 questions. Answer **any 5** questions in approximately 200 words each. Each question carries **6** marks.   **(5x6=30 marks)**

Part C contains 5 questions. Answer **any 3** questions in approximately 500 words each. Each question carries **10** marks.   **(3x10=30 marks)**

Part A

1.
   a. The physical components of a computer system, such as the CPU and keyboard, are known as _____. (Hardware/Software)

   b. Which of the following is a primary input device? (Mouse/Printer)

   c. True or False: Cloud services require an internet connection to function.

   d. _____ is the default file extension of a Microsoft Word document. (.docx/.pptx)

   e. _____ ensures unauthorized access to a computer system is prevented. (Cyber security/Cloud computing)

   f. True or False: Microsoft Excel can be used for data analysis and creating charts.

   g. _____ tools enable real-time communication over the internet using video and audio. (Video conferencing/Video editing)

   h. In online forms, _____ is used to capture responses from users. (Google Forms/ Microsoft Paint)

   i. _____ tools are used to convert text or speech from one language to another. (Translation/ Animation)

   j. The CPU is often referred to as the _____ of a computer system. (Brain/ Heart)

PART B

2. Define and explain the role of input and output devices in a computer system.

3. Describe how web-based technologies have impacted education and communication.

4. Write a short note on the importance of cyber security in the modern world.

5. Explain any three features of Microsoft Word that are commonly used for document formatting.

6. Illustrate the process of creating a basic PowerPoint presentation with examples of slide elements.

7. Discuss the significance of formulas and functions in MS Excel. Provide examples.

8. What are the key features of video conferencing tools, and how are they beneficial?

9. Discuss how artificial intelligence is being used in everyday applications.

PART C

10. What are the different types of computers, and how are they used for various applications?

11. Explain different types of software with examples and the major threats to cyber security. Suggest measures to mitigate them.

12. Describe the advanced features of MS Excel with examples.

13. Critically analyze the role of social media in professional and personal life. Mention advantages, disadvantages, and ethical considerations.

14. Compare and contrast the benefits of cloud services and collaborative tools in the modern workplace. Provide examples of tools for each.

***